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VOLUME 7 PART 2

NORTH AMERICAN FLORA

UREDINALES

COLEOSPORIACEAE, UREDINACEAE, AECIDIACEAE (pars)

JOSEPH CHARLES ARTHUR

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ANNOUNCEMENT

The NORTH AMERICAN FLORA is designed to present in one work descriptions of all plants growing, independent of cultivation, in North America, here taken to include Greenland, Central America, the Republic of Panama, and the West Indies, except Trinidad, Tobago, and Curaçao and other islands off the north coast of Venezuela, whose flora is essentially South American.

The work will be published in parts at irregular intervals, by the New York Botanical Garden, through the aid of the income of the David Lydig Fund bequeathed by Charles P. Daly.

It is planned to issue parts as rapidly as they can be prepared, the extent of the work making it possible to commence publication at any number of points. The completed work will form a series of volumes with the following sequence:

Volume 1. Mycetozoa, Schizophyta, Diatomaceae.

Volumes 2 to 10. Fungi.

Volumes 11 to 13. Algae.

Volumes 14 and 15. Bryophyta.

Volume 16. Pteridophyta and Gymnospermae.

Volumes 17 to 19. Monocotyledones.

Volumes 20 to 30. Dicotyledones.

The preparation of the work has been referred by the Scientific Directors of the Garden to a committee consisting of Professors L. M. Underwood and N. L. Britton.

Professor George F. Atkinson, of Cornell University; Professors Charles R. Barnes and John M. Coulter, of the University of Chicago; Mr. Frederick V. Coville, of the United States Department of Agriculture; Professor Edward L. Greene, of the United States National Museum; Professor Byron D. Halsted, of Rutgers College; and Professor William Trelease, of the Missouri Botanical Garden, have consented to act as an advisory committee.

Each author will be wholly responsible for his own contributions, being restricted only by the general style adopted for the work, which must vary somewhat in the treatment of diverse groups.

The subscription price is fixed at $1.50 for each part; it is expected that four or five parts will be required for each volume. A limited number of separate parts will be sold at $2.00 each. Address:

THE NEW YORK BOTANICAL GARDEN
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Order **UREDINALES**

By Joseph Charles Arthur

Small, mostly microscopic fungi, parasitic in the tissues of Pteridophyta (Filicales) and Spermatophyta. Mycelium much branched, septate, usually ramifying in the walls of the cells and extending haustoria into the cavities. Spores borne in more or less definite sori below the surface of the host, or rarely buried singly within the host, and set free by early rupture, or in case of some resting spores, by weathering away of the overlying tissues. Sori naked, enclosed by peridia or paraphyses, or imbedded in a thin stroma. Spores of five morphological sorts, not all present in every genus: (1) basidiospores, minute, thin-walled, without surface sculpturing, (2) pycniospores, small, smooth, of unknown function, (3) aeciospores, verrucosely sculptured, borne in chains, (4) urediniospores, echinulately or verrucosely sculptured, borne singly, or sometimes in chains (*Coleosporium*, *Melampsoropsis*), (5) teliospores, smooth or variously sculptured but not echinulate, borne singly or in chains. Pycniospores, aeciospores, urediniospores, and teliospores follow each other in the order named; but any one or all, except the last, may be wanting in certain genera. An alternation of phases is conspicuously shown in many genera, the pycnia (rarely absent) with one other spore-structure composing the gametophytic phase, and the telia, usually with one other spore-structure, the sporophytic phase. In every species the mycelium eventually gives rise to teliospores, which produce in germination four basidia, either remaining within the spore-cell (*Coleosporiaceae*) or borne in the air on a short promycelium, each basidium supporting a single, stalked or sessile basidiospore.

Basidia internal; teliospores compacted laterally into waxy layers; walls of spores weakly gelatinous.	Fam. 1. Coleosporiaceae.
Basidia external.	
Teliospores compacted laterally into a crust or column (rarely solitary within the tissues); walls of spores firm.	Fam. 2. Uredinaceae.
Teliospores free or fascicled; walls of spores firm, or with an outer hygroscopic layer, overlaid by cuticle.	Fam. 3. Aecidiaceae.

Family 1. COLEOSPORIACEAE

By Joseph Charles Arthur

Basidia internal. Telia waxy; teliospores usually compacted laterally into layers, sessile (pedicelled in the South American genus *Chrysopsora*), the walls weakly gelatinous.

Both North American genera belong to the subfamily Coleosporiatae, with basidiospores on long sterigmata; pycnia and other sori originating between the epidermis and mesophyl; aecia when present with bladdery peridium rupturing irregularly; uredinia when present naked, with catenulate spores.

Life-cycle with all spore-forms.	1. Coleosporium.
Life-cycle with only telia.	2. Gallowaya.

1. COLEOSPORIUM Lév. Ann. Sci. Nat. III. 8: 373. 1847.

Peridermium Chev. Fl. Env. Paris 1: 385. 1826. Not *Peridermium* Schmidt & Kunze, 1817.
Erannium Bon. Coniom. 17. 1860.
Stichopsora Dietel, Bot. Jahrb. **27**: 565. 1899.

Cycle of development includes pycnia, aecia, uredinia and telia, with distinct alternating phases; heteroecious. Pycnia and other sori subepidermal.

Pycnia flattish, linear, dehiscent by a slit, without ostiolar filaments.

Aecia erumpent, definite. Peridium colorless with verrucose walls. Aeciospores globose to oblong, with colorless wall, the outer part formed of densely packed, deciduous tubercles.

Uredinia erumpent, definite, without peridium. Urediniospores catenulate, globoid to oblong, pulverulent; wall colorless, closely verrucose, pores obscure.

Telia indehiscent except through weathering, waxy, somewhat indefinite, usually roundish. Teliospores sessile (by successive formation and by displacement due to lateral pressure often appearing catenulate and pedicellate), one-celled (by early division of the contents appearing four-celled); wall smooth, colorless, thickened and gelatinous at apex.

Type species, *Uredo Rhinanthacearum* DC. (on *Rhinanthus glaber*).

Telia and uredinia inhabiting monocotyledonous hosts (Orchidaceae).	1. *C. Bletiae.*
Telia and uredinia inhabiting dicotyledonous hosts.	
Host belonging to family Grossulariaceae.	2. *C. ribicola.*
Host belonging to family Loasaceae.	3. *C. Mentzeliae.*
Host belonging to family Begoniaceae.	4. *C. Begoniae.*
Host belonging to family Apocynaceae.	
Urediniospores thin-walled, tubercles persistent.	5. *C. apocynaceum.*
Urediniospores thicker-walled, tubercles deciduous.	6. *C. Plumierae.*
Host belonging to family Convolvulaceae.	7. *C. Ipomoeae.*
Host belonging to family Caprifoliaceae.	8. *C. Viburni.*
Host belonging to family Campanulaceae.	9. *C. Campanulae.*
Host belonging to family Carduaceae.	
Of the tribe Vernonieae.	
Urediniospores thin-walled, thicker above.	10. *C. Vernoniae.*
Urediniospores rather thick-walled, of uniform thickness.	11. *C. Elephantopodis.*
Of the tribe Eupatorieae.	
Urediniospores small; wall medium thick, tuberculate.	12. *C. Eupatorii.*
Urediniospores large; wall thin, papillose.	
Teliospores cylindrical.	13. *C. Steviae.*
Teliospores clavate.	14. *C. Laciniariae.*
Of the tribe Astereae.	15. *C. Solidaginis.*
Of the tribe Heliantheae.	
Urediniospores large; wall unevenly thick.	16. *C. Madiae.*
Urediniospores small; wall thin.	
Telia prominent, often confluent in pustular groups.	17. *C. anceps.*
Telia low, scattered.	
Teliospores narrowed at both ends, apical outlines distinct.	18. *C. Helianthi.*
Teliospores cylindrical, apical outlines indistinguishable.	
Apical wall swelling 10–20 μ.	19. *C. Dahliae.*
Apical wall swelling 20–30 μ.	20. *C. Terebinthinaceae.*
Of the tribe Senecioneae.	
Uredinia large; urediniospores thick-walled.	21. *C. arnicale.*

Uredinia small; urediniospores thin-walled.
Teliospores oblong. 22. *C. paraphysatum*.
Teliospores oblong-clavate. 23. *C. occidentale*.
Teliospores clavate. 24. *C. Senecionis*.

1. **Coleosporium Bletiae** Dietel, Hedwigia **37**: 216. 1898.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, irregularly scattered, small, 0.3 mm. across, early naked, yellow fading to white, ruptured epidermis noticeable; urediniospores ellipsoid or globoid, 14–20 by 20–25 μ; wall thin, 1–1.5 μ, finely but conspicuously verrucose with crowded papillae.

III. Telia hypophyllous, irregularly scattered, somewhat confluent, often crowded in annular groups about the uredinia, 0.3–0.5 mm. across, slightly elevated, orange-yellow fading to pale dull-yellow; teliospores with wall swelling 15–20 μ thick above; contents orange-yellow fading to colorless, terete or somewhat clavate, 16–20 by 58–77 μ, truncate or rounded at each end.

ON ORCHIDACEAE:
Phajus Wallichii Lindl. (*P. grandiflorus* Reichb.), California.
TYPE LOCALITY: Tokio, Japan, on *Bletia hyacinthina*.
DISTRIBUTION: Central California on plants imported from Japan; also in Japan.
EXSICCATI: Sydow, Ured. *1232*.

2. **Coleosporium ribicola** (C. & E.) Arthur.

Uredo ribicola C. & E. Grevillea **6**: 86. 1878.
Uredo Jonesii Peck, Bull. Torrey Club **12**: 36. 1885.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered or in small open groups on conspicuous yellow spots, 0.5 mm. across, tardily naked, reddish orange-yellow fading to pale-yellow, becoming pulverulent; urediniospores broadly oval, or globoid, 20–27 by 26–30 μ; wall thick, 3–5 μ, densely verrucose with slender cylindrical tubercles.

III. Telia hypophyllous, resembling the uredinia, scattered or in small open groups on conspicuous yellow spots, 0.5 mm. across, reddish orange-yellow fading to pale-yellow; teliospores with wall swelling 15–25 μ above; contents orange-yellow fading to pale-yellow, terete, 17–22 by 48–60 μ, rounded or acute at both ends.

ON GROSSULARIACEAE:
Ribes inebriens Lindl., Colorado.
Ribes leptanthum A. Gray, Colorado, New Mexico.
Ribes longifolium Nutt., Colorado.
Ribes pumilum Nutt., Colorado.
Ribes Purpusi Koehne, Colorado, New Mexico, Wyoming.
TYPE LOCALITY: Rocky Mountains [Colorado], on *Ribes* [*leptanthum*].
DISTRIBUTION: Central Rocky Mountain region.
EXSICCATI: Ellis & Ev. N. Am. Fungi *2258*.

3. **Coleosporium Mentzeliae** (Dietel & Holway) Arthur.

Stichopsora Mentzeliae Dietel & Holway, Bot. Gaz. **31**: 337. 1901.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, 0.5 mm. or less across, early naked, orange-yellow fading to white, ruptured epidermis barely noticeable; urediniospores globoid, 20–24 by 20–28 μ; wall rather thin, 1.5–2 μ, closely and conspicuously verrucose, with elongate papillae.

III. Telia hypophyllous, scattered, small, 0.25 mm. across, blood-red fading to pale-yellow; teliospores with wall swelling to 8 μ thick above; contents orange-yellow fading to colorless, cylindrical, or somewhat clavate, 14–20 by 24–45 μ, rounded at both ends.

ON LOASACEAE:
Mentzelia hispida Willd., Jalisco.
TYPE LOCALITY: Chapala, Mexico, on *Mentzelia hispida*.
DISTRIBUTION: Central Mexico.

4. **Coleosporium Begoniae** Arthur, sp. nov.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, 0.5 mm. across, soon naked, yellow fading to white, very pulverulent, ruptured epidermis inconspicuous; urediniospores ellipsoid, or

nearly globoid, usually angular, 15-19 by 26-29 μ; wall thin, 1.5 μ, evenly verrucose with small papillae.

III. Telia hypophyllous, densely crowded in orbicular or angular groups, 3-8 mm. across, sometimes bounded by the veins, centripetal in development, very small, 0.25 mm. or less across, pulvinate, orange-yellow fading to light-yellow; teliospores with wall swelling 15-20 μ thick above; contents orange-yellow fading to colorless, oblong, 15-21 by 38-58 μ, rounded or obtuse at each end, slightly or not narrowed below.

ON BEGONIACEAE:
Begonia sp., Jalisco, Michoacan, Oaxaca, Puebla.
Type collected at Guadalajara, Mexico, September 28, 1903, *E. W. D. Holway 5064*.
DISTRIBUTION: Central Mexico.

5. **Coleosporium apocynaceum** Cooke, Hedwigia **17**: 38. 1878.

Uredo Amsoniae Cooke, Grevillea **19**: 15. 1890.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, small, 0.3 mm. across, soon naked, orange-yellow fading to very pale-yellow, ruptured epidermis rather inconspicuous; urediniospores broadly elliptical or globoid, 19-23 by 22-30 μ; wall thin, 1 μ, verrucose with low, scarcely crowded papillae.

III. Telia hypophyllous, rather evenly and closely scattered over areas 3-8 mm. across, or over the whole leaf, roundish, prominent, at first orange-yellow, fading to pale-yellow; teliospores with wall swelling 25-35 μ above; contents oblong or clavate-oblong, 13-19 by 39-51 μ, rounded at both ends.

ON APOCYNACEAE:
Amsonia Amsonia (L.) Britton (*A. Tabernaemontana* Walt.), Alabama, South Carolina.
Amsonia ciliata Walt. (*A. angustifolia* Michx.), South Carolina.
TYPE LOCALITY: South Carolina, on *Amsonia ciliata*.
DISTRIBUTION: Southeastern United States.
EXSICCATI: Rav. Fungi Am. *44*, *489*.

6. **Coleosporium Plumierae** Pat. Bull. Soc. Myc. Fr. **18**: 178. 1902.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, 0.3-0.5 mm. across, soon naked, orange-yellow fading to tawny-yellow, ruptured epidermis rather inconspicuous; urediniospores broadly ellipsoid or obovoid, 19-24 by 26-37 μ; wall rather thin, 1.5-2 μ, rather coarsely verrucose with low deciduous tubercles, 3-5 μ across, not crowded.

III. Telia hypophyllous, scattered, round, punctiform, 0.1-0.3 mm. across; teliospores with wall swelling 10-20 μ above; contents fading to colorless, oblong, 10-13 by 26-33 μ, rounded or obtuse at both ends.

ON APOCYNACEAE:
Plumiera alba L., Guadeloupe.
Plumiera rubra L., Cuba.
TYPE LOCALITY: Guadeloupe, on *Plumiera alba*.
DISTRIBUTION: West India Islands.
EXSICCATI: Ellis & Ev. Fungi Columb. *2217*.

7. **Coleosporium Ipomoeae** (Schw.) Burrill, Bull. Ill. Lab. Nat. Hist. **2**: 217. 1885.

Uredo Ipomoeae Schw. Schr. Nat. Ges. Leipzig **1**: 70. 1822.
Caeoma Ipomoeae Link, in Willd. Sp. Pl. 6^2: 14. 1825.
Coleosporium guaraniticum Speg. Anal. Soc. Ci. Argent. **17**: 95. 1884.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, widely scattered, or somewhat clustered, 0.25-1 mm. across, early naked, orange-yellow fading to white, ruptured epidermis usually inconspicuous; urediniospores ellipsoid, 13-21 by 18-27 μ, more or less angular and irregular; wall thin, 1-1.5 μ, closely and noticeably verrucose.

III. Telia hypophyllous, widely scattered, often confluent, pulvinate, 0.5 mm. or less across, deep reddish-orange fading to pale-yellow; teliospores with wall swelling 20-40 μ above; contents orange-yellow fading to colorless, oblong, or slightly clavate, 19-23 by 60-80 μ, rounded or obtuse at both ends.

ON CONVOLVULACEAE:
Calonyction aculeatum (L.) House (*Ipomoea Bona-nox* L.), Texas.
Convolvulus Sepium L., Alabama.
Ipomoea Batatas Lam., Mississippi; Mexico.
Ipomoea dubia Hemsl., Oaxaca.
Ipomoea lacunosa L., Georgia, Illinois, Louisiana, Mississippi.
Ipomoea laeta A. Gray, Mexico.
Ipomoea macrocalyx (R. & P.) Choisy, Guatemala.
Ipomoea pandurata (L.) Meyer, Alabama, Delaware, Illinois, Indiana, Kansas, Mississippi, Missouri, New Jersey, Ohio, South Carolina, West Virginia.
Ipomoea speciosa Walt. (*I. sagittata* Cav.), Florida, Mississippi.
Ipomoea stans Cav., Jalisco.
Ipomoea triloba L., North Carolina.
Ipomoea tyrianthina Lindl., Guatemala.
Pharbitis cathartica (Poir.) Choisy (*Ipomoea cathartica* Poir.), Jamaica.
Pharbitis hederacea (L.) Choisy (*Ipomoea hederacea* Jacq., *I. Nil* Roth), District of Columbia, Florida, Illinois, Kansas, Louisiana, Maryland, Missouri, South Carolina, Texas, Virginia; Jalisco; Guatemala.
Pharbitis purpurea (L.) Voigt (*Ipomoea purpurea* Roth), Alabama, Mississippi, Texas.
Quamoclit coccinea (L.) Moench, Illinois; Jalisco; St. Croix.
Quamoclit Quamoclit (L.) Britton (*Ipomoea Quamoclit* L.), Mississippi.
Thyella tamnifolia (L.) Raf. (*Jacquemontia tamnifolia* Griseb.), Louisiana.

TYPE LOCALITY: North Carolina, on *Ipomoea triloba*.

DISTRIBUTION: New Jersey to Illinois and Kansas, southward to Florida, West Indies and Central America; also in South America.

EXSICCATI: Ellis & Ev. N. Am. Fungi *3247*; Seym. & Earle, Econ. Fungi *333*, *335*, *338a*, *338b*; Sydow, Ured. *1335*, *1440*, *1994*; Rab.-Wint. Fungi Eur. *3310*; Ellis & Ev. Fungi Columb. *656*, *2011*.

8. **Coleosporium Viburni** Arth. Bull. Iowa Agr. Coll. Dep. Bot. **1884**: 163. 1884.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered or somewhat gregarious, 0.5 mm. across, early naked, yellow fading to brownish-white, ruptured epidermis conspicuous; urediniospores ellipsoid, 19–25 by 24–32 μ; wall medium thick, 2–2.5 μ, closely verrucose, with prominent, irregular tubercles.

III. Telia hypophyllous, irregularly scattered, or somewhat gregarious, often confluent, 0.5–1 mm. across, pulvinate, bright orange-yellow fading to dull golden-yellow; teliospores with wall swelling 25–35 μ thick above; contents orange-yellow fading to nearly colorless, terete, or clavate-oblong, 17–25 by 50–85 μ, rounded or obtuse at apex, obtuse or narrowed below; basidiospores ovate or elliptical, one-sided.

ON CAPRIFOLIACEAE:
Viburnum Lentago L., Iowa, Wisconsin.
Viburnum sp., Mexico (state).

TYPE LOCALITY: Charles City, Iowa, on *Viburnum Lentago*.

DISTRIBUTION: Upper Mississippi valley and Central Mexico; also in South America and Japan.

9. **Coleosporium Campanulae** (Pers.) Lév. Ann. Sci. Nat. III. **8**: 373. 1847.

Uredo Campanulae Pers. Syn. Fung. 217. 1801.
Uredo tremulosa Campanulae Strauss, Ann. Wett. Ges. **2**: 90. 1810.
Caeoma Campanularum Link, in Willd. Sp. Pl. 6^2: 16. 1825.
Peridermium Rostrupi Ed. Fisch. Bull. Soc. Bot. Fr. **41**: clxxi. 1894.

O. Pycnia amphigenous, scattered, numerous, originating between mesophyl and cortical layer, noticeable, large, 0.2–0.4 mm. wide, 1–2 mm. long, dehiscent by a longitudinal slit, 90–110 μ high.

I. Aecia from a limited mycelium, amphigenous, scattered, 1–3 on discolored spots, bullate, tongue-shaped, large, 1–3 mm. long, 0.7–1.5 mm. high, yellow fading to white; peridium rupturing irregularly, fragile, white, cells overlapping, outer and inner walls same thickness, about 4–6 μ, outer smooth, inner moderately verrucose; aeciospores broadly ellipsoid or globoid, 17–22 by 22–31 μ; wall colorless, thin, 2–3.5 μ, densely verrucose, with prominent, elongate papillae.

ON PINACEAE:
Pinus rigida Mill., Ohio.

II. Uredinia hypophyllous, scattered, often confluent, 0.5–1 mm. across, soon naked, orange-red fading to white, ruptured epidermis evident; urediniospores ellipsoid, 18–23 by 20–30 μ; wall thin, 1–1.5 μ, densely verrucose, with prominent, elongate papillae.

III. Telia hypophyllous, scattered, often confluent, small, 0.2–0.5 mm. across, slightly elevated, blood-red fading to pale brownish-yellow; teliospores with wall swelling 15–25 μ thick above; contents orange-red fading to nearly colorless, cylindrical or clavate-oblong, 17–24 by 55–85 μ, rounded or obtuse at each end.

ON CAMPANULACEAE:
Campanula rapunculoides L., Maryland, New York, Vermont.
Campanulastrum americanum (L.) Small (*Campanula americana* L.); Ohio, West Virginia.
Specularia perfoliata (L.) A. DC. (*Campanula perfoliata* L., *C. amplexicaulis* Michx.), North Carolina, Pennsylvania.
TYPE LOCALITY: Europe, on *Campanula* sp.
DISTRIBUTION: Vermont to Ohio and southward in the mountains to North Carolina; also in Europe.
EXSICCATI: Seym. & Earle, Econ. Fungi *485*; Ellis & Ev. Fungi Columb. *1913*; Kellerm. Ohio Fungi *104, 163*; Sydow, Ured. *1393*.

10. **Coleosporium Vernoniae** B. & C. Greville 3: 57. 1874.

Stichopsora Vernoniae Dietel, Hedwigia Beibl. **42**: 179. 1903.

O. and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, 0.5 mm. across, scattered irregularly, soon naked, yellow fading to white, ruptured epidermis scarcely noticeable; urediniospores elliptical-globoid or obovate, 15–20 by 22–27 μ; wall rather thin, 1–2 μ, often thicker above, 2–5 μ, closely and strongly verrucose; contents orange-yellow when fresh, fading to colorless.

III. Telia hypophyllous, 0.5–1 mm. across, often confluent, orange-yellow; teliospores with wall swelling 30–40 μ above; contents orange-yellow when fresh, oblong-clavate or terete, 19–24 by 50–67 μ, rounded or obtuse above, narrowed below.

ON CARDUACEAE:
Vernonia altissima Nutt. (*V. maxima* Small), Alabama, Georgia, Indiana, Kentucky, Missouri, Ohio.
Vernonia angustifolia Michx., Alabama.
Vernonia Baldwinii Torr., Arkansas, Kansas, Missouri.
Vernonia crinita Raf., Missouri.
Vernonia fasciculata Michx., Illinois, Indiana, Ohio.
Vernonia flaccidifolia Small, Alabama.
Vernonia gigantea (Nutt.) Britton, Florida.
Vernonia glauca (L.) Britton, North Carolina.
Vernonia guadalupensis Heller, Texas.
Vernonia interior Small, Missouri.
Vernonia missourica Raf. (*V. Drummondii* Schaff.), Arkansas, Missouri, Nebraska, Texas.
Vernonia noveboracensis (L.) Willd., Connecticut, Massachusetts, New Jersey, North Carolina, Pennsylvania, Tennessee, West Virginia.
Vernonia ovalifolia T. & G., Alabama.
Vernonia texana (A. Gray) Small, Texas.
TYPE LOCALITY: Alabama, on *Vernonia* sp.
DISTRIBUTION: Massachusetts, Indiana and Kansas, south to Florida and Texas.
EXSICCATI: Rab.-Wint. Fungi Eur. *3127*; Sydow, Ured. *1098*; Kellerm. Ohio Fungi, *86, 159*; Ellis & Ev. Fungi Columb. *657, 1615*; Seym. & Earle, Econ. Fungi, *319, 483*; Ellis, N. Am. Fungi *275*.

11. **Coleosporium Elephantopodis** (Schw.) Thüm. Myc. Univ. *953*. 1878.

Uredo Elephantopodis Schw. Schr. Nat. Ges. Leipzig **1**: 70. 1822.
Caeoma Elephantopodis Link, in Willd. Sp. Pl. 6^2: 20. 1825.
Stichopsora Elephantopodis Dietel, Hedwigia Beibl. **42**: 181. 1903.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, or sometimes only on one side or the other, in open groups, or scattered, 0.25–0.5 mm. across, soon naked, yellow when fresh, fading to white, ruptured epidermis scarcely noticeable; urediniospores ellipsoid or globoid, 16–20 by 22–28 μ; wall medium thick, 1.5–2.5 μ, densely verrucose with irregular, deciduous tubercles, which are 1–1.5 μ long.

III. Telia hypophyllous, in open groups, or scattered, often confluent, 0.25–0.5 mm. across; teliospores with walls swelling 30–40 μ thick above; contents orange-yellow when fresh, oblong-clavate or terete, 20–23 by 48–70 μ, rounded or obtuse above, narrowed below.

ON CARDUACEAE:
Elephantopus angustifolius Sw., St. Vincent.
Elephantopus carolinianus Willd., Alabama, Arkansas, Florida, Illinois, Indian Territory, Kentucky, Louisiana, Mississippi, Missouri, New Jersey, South Carolina, Tennessee, Virginia.

Elephantopus mollis H. B. K., Guatemala; Jamaica; Porto Rico.
Elephantopus nudatus A. Gray, Alabama, Virginia.
Elephantopus scaber L., Cuba; Porto Rico.
Elephantopus tomentosus L., Alabama, Florida, Mississippi, South Carolina, Texas, Virginia.

TYPE LOCALITY: North Carolina, on *Elephantopus tomentosus*.
DISTRIBUTION: Virginia and southern Illinois to Central America and the West Indies; also in South America.
EXSICCATI: Ellis, N. Am. Fungi *1483*; Ellis & Ev. N. Am. Fungi *1880a*.

12. **Coleosporium Eupatorii** Arth. Bull. Torrey Club **33**: 31. 1906.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, scattered, small, 0.25 mm. across, early naked, yellow fading to white, ruptured epidermis somewhat noticeable; urediniospores short-ellipsoid or globoid, 15–20 by 22–27 μ; wall medium thick, 2–2.5 μ, half formed by the rather large, irregular, deciduous tubercles.

III. Telia unknown.

ON CARDUACEAE:
Eupatorium collinum DC., Guatemala.
Eupatorium macrophyllum L., Cuba; Nicaragua.
TYPE LOCALITY: El Yunque, Baracoa, Cuba, on *Eupatorium macrophyllum*.
DISTRIBUTION: West Indies and Central America.

13. **Coleosporium Steviae** Arth. Bot. Gaz. **40**: 197. 1905.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered unevenly and often thickly, 0.25–0.5 mm. across, early naked, yellowish fading to white, ruptured epidermis somewhat noticeable; urediniospores ellipsoid to globoid, more or less angular, 18–23 by 26–35 μ; wall rather thin, 1.5–2 μ, finely verrucose.

III. Telia hypophyllous, scattered unevenly, often confluent, 0.25–0.5 μ across, slightly elevated, orange-yellow fading to very pale-yellow; teliospores with wall swelling 30–40 μ thick above; contents orange-yellow fading to colorless, cylindrical, 12–19 by 50–75 μ, truncate or rounded at both ends.

ON CARDUACEAE:
Stevia monardaefolia H.B.K., Mexico (state), Michoacan, Morelos.
Stevia reglensis Benth., Mexico (state).
Stevia rhombifolia H.B.K., Mexico (state).
Stevia salicifolia Cav., Hidalgo, Mexico (state), Michoacan.
Stevia trachelioides (DC.) Hook., Mexico (state).
Stevia viscida H.B.K., Mexico (state).
TYPE LOCALITY: Nevada de Toluca, Mexico, on *Stevia trachelioides*.
DISTRIBUTION: Central Mexico.

14. **Coleosporium Laciniariae** Arthur, sp. nov.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, large, 1 mm. across, soon naked, yellow fading to a dirty white, ruptured epidermis mostly inconspicuous; urediniospores subelliptical or globoid, 18–23 by 24–35 μ; wall rather thin, 1.5 μ, closely and strongly verrucose with uniform papillae.

III. Telia amphigenous, and sometimes caulicolous, scattered, often confluent, somewhat elevated, reddish-orange; teliospores with wall swelling 30–40 μ thick above; contents orange-yellow when fresh, fading to colorless, clavate or oblanceolate, 16–21 by 58–77 μ, obtuse or sometimes narrowed above, much narrowed below.

ON CARDUACEAE:
Laciniaria Chapmanii (T. & G.) Kuntze, Florida.
Laciniaria graminifolia (Walt.) Kuntze (*Liatris graminifolia* Pursh), Alabama.
Type collected at Auburn, Alabama, on *Laciniaria graminifolia*, October, 1895, *L. M. Underwood*.
DISTRIBUTION: Southeastern United States.

15. **Coleosporium Solidaginis** (Schw.) Thüm. Bull. Torrey Club **6**: 216. 1878.

Uredo Solidaginis Schw. Schr. Nat. Ges. Leipzig **1**: 70. 1822.
Caeoma (*Uredo*) *Solidaginis* Schw. Trans. Am. Phil. Soc. II. **4**: 291. 1832.
Peridermium acicolum Underw. & Earle, Bull. Torrey Club **23**: 400. 1896.
Stichopsora Asterum Dietel, Bot. Jahrb. **28**: 565. 1899.
Stichopsora Solidaginis Dietel, Hedwigia Beibl. **42**: 181. 1903.

O. Pycnia amphigenous, scattered, numerous, originating between mesophyl and cortical layer, noticeable, 0.3–0.5 mm. wide by 0.5–0.8 mm. long, dehiscent by a longitudinal slit, low-conoidal, 80–100 μ high.

I. Aecia from a limited mycelium, amphigenous, numerous, scattered on discolored spots occupying part of a leaf, erumpent from longitudinal slits, tongue-shaped, 0.5–1 mm. long by 0.5–0.7 mm. high; peridium rupturing irregularly, moderately firm, white, cells overlapping, 35–45 μ long, not much narrower, walls transversely striate, inner coarsely verrucose, thick, 5–6 μ, outer less rough and somewhat thinner; aeciospores ellipsoid, 20–25 by 28–40 μ; wall colorless, closely and coarsely verrucose with deciduous tubercles, which are directed away from a smooth spot extending up one side, thick, 2–3 μ on the smooth spot, increasing to 5–6 μ on the opposite side, including the tubercles.

ON PINACEAE:

Pinus rigida Mill., Connecticut, Massachusetts, New Jersey, New York.

II. Uredinia hypophyllous, rarely also epiphyllous, irregularly scattered, or at first somewhat gregarious and crowded, 0.3–0.5 mm. across, soon naked, yellow or orange-yellow, ruptured epidermis inconspicuous; urediniospores ellipsoid or globoid, 17–22 by 20–30 μ; wall rather thin, 1–2 μ, closely and strongly verrucose; contents orange-yellow when fresh, fading to colorless.

III. Telia hypophyllous, scattered irregularly or sometimes crowded and confluent, slightly elevated, 0.3–0.5 mm. across, reddish-orange; teliospores with wall swelling 30–40 μ thick above; contents orange-yellow fading to colorless, terete, 15–23 by 55–80 μ, rounded or obtuse at both ends; basidiospores globoid or elliptical, about 12 by 18 μ, orange-yellow.

ON CARDUACEAE:

Aster chilensis Nees (*A. Chamissonis* A, Gray), California.
Aster conspicuus Lindl., Idaho, Montana.
Aster cordifolius L., Illinois, Indiana, Massachusetts, New York, Pennsylvania, Virginia.
Aster divaricatus L. (*Aster corymbosus* Ait.), Wisconsin.
Aster Drummondii Lindl., Illinois, Indiana, Iowa.
Aster dumosus L., Alabama.
Aster Eatoni (A. Gray) Howell, Montana, Washington.
Aster ericoides L., Illinois, South Carolina.
Aster laevis L., Iowa.
Aster lateriflorus (L.) Britton (*A. diffusus* Ait., *A. miser* Nutt.), Alabama, Iowa, New York, Ohio.
Aster Lindleyanus T. & G., Colorado, Maine.
Aster longifolius Lam., Maine.
Aster macrophyllus L., Maine, Michigan, Ohio, Wisconsin.
Aster multiflorus Ait., Iowa.
Aster nebraskensis Britton, Nebraska.
Aster Novae-Angliae L., Connecticut, Illinois, Indiana, Ohio.
Aster Novi-Belgii L., Maine, Massachusetts.
Aster occidentalis Nutt., British Columbia.
Aster paniculatus Lam., Indiana, Kansas, Ohio.
Aster paniculatus simplex (Willd.) Burgess, Massachusetts.
Aster patens Ait., Alabama, Michigan.
Aster pauciflorus Nutt. (*A. caricifolius* H.B.K.), Mexico (state).
Aster prenanthoides Muhl., Ohio.
Aster puniceus L., Indiana, West Virginia, Wisconsin.
Aster radulinus A. Gray, California.
Aster sagittifolius Willd., Indiana, Iowa.
Aster salicifolius Lam. (*A. carneus* T. & G.), Iowa, Kansas, Missouri, Pennsylvania.
Aster Shortii Hook., Indiana, Missouri.
Aster Tradescanti L., New York.
Aster undulatus L., Alabama.
Aster vimineus Lam. (*A. Tradescanti* T. & G.), Minnesota.
Callistephus hortensis Cass., Maryland, Massachusetts, New Jersey, New York, South Carolina, West Virginia.
Chrysoma pauciflosculosa (Michx.) Greene (*Solidago pauciflosculosa* Michx.), Mississippi.
Doellingeria sericocarpoides Small, Texas.
Doellingeria umbellata (Mill.) Nees (*Aster umbellatus* Mill.), Maine, Minnesota, New Hampshire.
Euthamia graminifolia (L.) Nutt. (*Solidago lanceolata* L.), Connecticut, Kansas, Maine, Massachusetts, New Hampshire, New York, Pennsylvania, West Virginia.
Euthamia leptocephala (T. & G.) Greene, Texas.
Solidago arguta Ait., Indiana, New York.
Solidago bicolor L., New York.
Solidago caesia L., Alabama, Indiana, Massachusetts, New York, Virginia.
Solidago californica Nutt., California.

Solidago canadensis L., Alabama, Illinois, Indiana, Iowa, Kansas, Maine, Michigan, Missouri, New Jersey, New York, Ohio, South Dakota, West Virginia.
Solidago Elliotlii T. & G., New Jersey.
Solidago flexicaulis L. (*S. latifolia* L.), Illinois, Indiana, Iowa, New York, Pennsylvania, Texas.
Solidago glaberrima Martens, Iowa, Montana, Nebraska.
Solidago juncea Ait., New York.
Solidago macrophylla Pursh, New Hampshire.
Solidago missouriensis Nutt., Washington.
Solidago monticola T. & G., Pennsylvania.
Solidago multiradiata scopulorum A. Gray, British Columbia.
Solidago neglecta T. & G., Maine.
Solidago nemoralis Ait., Maine, New Hampshire, West Virginia; Assiniboia.
Solidago patula Muhl., Alabama, Indiana.
Solidago procera Ait., Missouri.
Solidago puberula Nutt., New Jersey.
Solidago rugosa Mill. (*S. altissima* Ait.), Alabama, Connecticut, Indiana, Maine, New York, Vermont, West Virginia.
Solidago sempervirens L., Massachusetts, New Jersey.
Solidago serotina Ait. (*S. gigantea* Willd.), Connecticut, Indiana, Iowa, Kansas, New York, South Carolina.
Solidago uliginosa Nutt., Wisconsin; Ontario.
Solidago ulmifolia Muhl., Arkansas, Connecticut, Indiana, Missouri, Ohio.
Solidago Virgaurea L., New Hampshire.

TYPE LOCALITY: North Carolina, on *Solidago* sp.
DISTRIBUTION: Almost throughout the United States and Canada, to central Mexico.
EXSICCATI: Ellis & Ev. Fungi Columb. *495*, *1291*, *1719*, *1720*, *1882*, *1883*, *1982*, *2090*, *2175*, *2176*; Kellerm. Ohio Fungi *85*, *158*, *181*; Griff. West Am. Fungi *173a*; Sydow, Ured. *1097*, *1793*, *1892*, *1997*; Carleton, Ured. Am. *44*; Seym. & Earle, Econ. Fungi *223*, *477*; Ellis, N. Am. Fungi *1077*, *2222*.

16. **Coleosporium Madiae** Cooke, Grevillea **7**: 102. 1879.

Stichopsora Madiae Sydow, Ann. Myc. **2**: 30. 1904.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered or somewhat gregarious, 0.5–1 mm. across, early naked, bright orange-yellow fading to white, ruptured epidermis noticeable; urediniospores ellipsoid or globoid, 18–29 by 26–38 μ; wall medium thick, 2–4 μ, thicker on one side, 4–7 μ, densely and coarsely verrucose with elongate and somewhat deciduous papillae.

III. Telia hypophyllous, 0.5–1 mm. across, scattered or somewhat gregarious, often confluent, orange-yellow fading to pale-yellow; teliospores with wall swelling 20–30 μ thick above; contents orange-yellow fading to colorless, cylindrical or oblong-lanceolate, 16–20 by 48–65 μ, obtuse or acute at both ends.

ON CARDUACEAE:
Anisocarpus madioides Nutt. (*Madia Nuttallii* A. Gray), California.
Madaria corymbosa DC., California.
Madia anomala Greene, California.
Madia capitata Nutt., California.
Madia dissitiflora (Nutt.) T. & G., California.
Madia racemosa (Nutt.) T. & G., Washington.
Madia sativa Molina, California.
Zonanthemis corymbosa (DC.) Greene, California.

TYPE LOCALITY: Sierra Nevada, California, on *Madia Nuttallii*.
DISTRIBUTION: Pacific coast of the United States.
EXSICCATI: Ellis & Ev. N. Am. Fungi *2999*; Rab.-Wint.-Paz. Fungi Eur. *4012*; Ellis & Ev. Fungi Columb. *199*, *1718*; Sydow, Ured. *1794*.

17. **Coleosporium anceps** Dietel & Holway, Bot. Gaz. **31**: 337. 1901.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, large, 1 mm. across, early naked, deep-yellow fading to white, ruptured epidermis somewhat noticeable; urediniospores ellipsoid or globoid, 17–21 by 20–25 μ; wall rather thin, 1.5 μ, verrucose, with crowded, cylindrical papillae, somewhat deciduous.

III. Telia chiefly hypophyllous, 0.5–0.75 mm. across, scattered singly, or confluent in prominent orbicular or annular groups 2–4 mm. across, pulvinate, orange-yellow fading to pale-yellow; teliospores with wall swelling 35–45 μ above, rounded apical outline of each spore distinct; contents orange-yellow fading to colorless, cylindrical, 14–19 by 63–86 μ, rounded at both ends.

ON CARDUACEAE:
Verbesina sphaerocephala A. Gray, Jalisco.

TYPE LOCALITY: Chapala, Mexico, on *Verbesina sphaerocephala*.
DISTRIBUTION: Central Mexico.

18. **Coleosporium Helianthi** (Schw.) Arthur.

Caeoma (*Uredo*) *Helianthi* Schw. Trans. Am. Phil. Soc. II. **4**: 291. 1832.
Coleosporium Viguierae Dietel & Holway, Bot. Gaz. **24**: 34. 1897.
Coleosporium Verbesinae Dietel & Holway, Bot. Gaz. **31**: 337. 1901.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, or on some hosts epiphyllous, scattered irregularly, 0.25–0.75 mm. across, soon naked, golden-yellow fading to white, ruptured epidermis somewhat noticeable; urediniospores ellipsoid, 14–20 by 19–27 μ; wall rather thin, 1–1.5 μ, verrucose, with small, crowded papillae, somewhat deciduous.

III. Telia hypophyllous, scattered irregularly, often crowded, 0.5 mm. or less across, orange-yellow fading to pale-yellow, pulvinate; teliospores with wall swelling 30–40 μ, rounded apical outline of each spore usually quite distinct; contents bright orange-red fading to colorless, oblong, or somewhat clavate, 16–22 by 55–70 μ, obtuse and often narrowed at both ends.

ON CARDUACEAE:
Coreopsis major Oemleri (Ell.) Britton, Virginia.
Helianthus decapetalus L., Indiana.
Helianthus doronicoides Lam., Ohio.
Helianthus giganteus L., Pennsylvania.
Helianthus sp., Alabama, Arkansas, Illinois.
Verbesina gigantea Jacq., Guatemala; Jamaica.
Verbesina montanoifolia Rob. & Greenm., Michoacan.
Verbesina pinnatifida Cav., Jalisco.
Verbesina turbacensis H.B.K., Guatemala.
Verbesina virgata Cav., Mexico (state), Morelos, Oaxaca.
Viguiera helianthoides H.B.K. (*V. dentata* Spreng.), Mexico (state), Puebla.
TYPE LOCALITY: Bethlehem, Pennsylvania, on *Helianthus giganteus*.
DISTRIBUTION: Pennsylvania to Illinois, southward to Central America.
EXSICCATI: Seym. & Earle, Econ. Fungi *B 22*; Rab.-Wint.-Paz. Fungi Eur. *3907*; Ellis & Ev. N. Am. Fungi *1880b*.

19. **Coleosporium Dahliae** Arth. Bot. Gaz. **40**: 197. 1905.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, irregularly scattered, 0.5 mm. or less across, soon naked, yellow fading to white, ruptured epidermis somewhat conspicuous; urediniospores irregularly ellipsoid, 16–22 by 24–30 μ; wall rather thin, 2 μ, closely and strongly verrucose, with uniform papillae.

III. Telia hypophyllous, irregularly scattered, sometimes confluent, about 0.5 mm. across, brilliant orange-yellow fading to pale-yellow; teliospores with wall swelling 10–20 μ thick above; contents bright orange-yellow fading to pale greenish-yellow, oblong, 18–21 by 45–70 μ, rounded at both ends.

ON CARDUACEAE:
Dahlia variabilis (Willd.) Desf., Jalisco.
TYPE LOCALITY: City park, Guadalajara, Mexico, on *Dahlia variabilis*, cultivated.
DISTRIBUTION: Central Mexico.

20. **Coleosporium Terebinthinaceae** (Schw.) Arthur.

Uredo Terebinthinaceae Schw. Schr. Nat. Ges. Leipzig **1**: 70. 1822.
Caeoma (*Uredo*) *Terebinthinaceae* Schw. Trans. Am. Phil. Soc. II. **4**: 291. 1832.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, 0.25–0.5 mm. across, early naked, orange-yellow fading to white, ruptured epidermis somewhat noticeable; urediniospores globoid, 16–21 by 16–27 μ; wall medium thick, 1.5–2 μ, densely verrucose with low and somewhat deciduous papillae.

III. Telia hypophyllous, scattered, 0.5 mm. or less across, orange-yellow fading to pale-yellow, slightly elevated; teliospores with wall swelling 20–30 μ thick above; contents orange-yellow fading to colorless, oblong or cylindrical, 17–22 by 48–64 μ, truncate or rounded at both ends.

ON CARDUACEAE:
Parthenium integrifolium L., Virginia.
Polymnia maculata Cav., Mexico (state).

Silphium asperrimum Hook., Texas.
Silphium Asteriscus L., Louisiana.
Silphium integrifolium Michx., Illinois, Mississippi.
Silphium laciniatum L., Iowa, Kansas.
Silphium scaberrimum Ell., Texas.
Silphium terebinthinaceum Jacq., Illinois, North Carolina.
Silphium trifoliatum L., Alabama.
TYPE LOCALITY: North Carolina, on *Silphium terebinthinaceum*.
DISTRIBUTION: Virginia to Iowa and Kansas, south to Alabama and central Mexico.

21. **Coleosporium arnicale** Arthur, sp. nov.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, gregarious or scattered, large, 1 mm. or less in diameter, soon naked, orange-yellow, ruptured epidermis barely noticeable; urediniospores elliptical or globoid, 22–27 by 23–33 μ; wall rather thick, 2–3 μ, closely and finely verrucose with deciduous tubercles.

III. Telia unknown.

ON CARDUACEAE:
Arnica cana Greene, Washington.
Type collected at Falcon Valley, Washington, October 30, 1901, *W. N. Suksdorf 644*.

22. **Coleosporium paraphysatum** Dietel & Holway, Bot. Gaz. **31**: 337. 1901.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered irregularly, inconspicuous, small, 0.25 mm. across, early naked, ruptured epidermis inconspicuous; urediniospores obovate, or oblong-lanceolate, 16–22 by 26–43 μ; wall medium thick, 1.5–2.5 μ, coarsely verrucose with low, flat and deciduous tubercles.

III. Telia hypophyllous, scattered, small, 0.25 mm. across; teliospores with wall swelling 25–30 μ thick above; contents orange-yellow fading to colorless, oblong, 16–22 by 48–65 μ, rounded or truncate above, obtuse below.

ON CARDUACEAE:
Liabum discolor Benth. & Hook., Jalisco.
TYPE LOCALITY: Chapala, Mexico, on *Liabum discolor*.
DISTRIBUTION: Central Mexico.
EXSICCATI: Sydow, Ured. *1540*.

23. **Coleosporium occidentale** Arthur, sp. nov.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, or somewhat gregarious, small, 0.25–0.5 mm. across, soon naked, yellow fading to nearly white, ruptured epidermis evident; urediniospores broadly ellipsoid, 16–22 by 25–33 μ; wall medium thick, 1.5–2 μ, evenly but not densely verrucose, with low papillae.

III. Telia hypophyllous, scattered, small, about 0.25 mm. across, slightly raised, orange-yellow fading to pale-yellow; teliospores with wall swelling 15–20 μ thick above; contents orange-yellow fading to nearly colorless, oblong or clavate-oblong, 17–20 by 50–72 μ, rounded or truncate above, rounded or obtuse below.

ON CARDUACEAE:
Senecio hydrophiloides Rydb., Washington.
Type collected at Falcon Valley, Washington, July 17, 1900, *W. N. Suksdorf 586*.

24. **Coleosporium Senecionis** (Schum.) Fries, Summa Veg. Scand. 512. 1849.

Uredo farinosa β *Senecionis* Pers. Syn. Fung. 218. 1801.
Uredo Senecionis Schum. Enum. Pl. Saell. **2**: 229. 1803.
Caeoma Senecionis Schlecht. Fl. Berol. **2**: 119. 1824.
Peridermium oblongisporium Fuckel, Symb. Myc. 42. 1869.

O. Pycnia amphigenous, scattered, numerous, originating between mesophyl and cortical layer, noticeable, 0.2–0.3 mm. wide, 0.5–1 mm. long, dehiscent by a longitudinal slit, 70–100 μ high.

I. Aecia from a limited mycelium, amphigenous, bullate, tongue-shaped, 1–2 mm. long, 0.7–1 mm. high, whitish; peridium rupturing irregularly, fragile, white, cells overlapping, outer and inner walls of same thickness, 3–4 μ, outer smooth, inner moderately verrucose; aeciospores broadly ellipsoid, 17–24 by 28–36 μ; wall colorless, thick, 3–4 μ, densely verrucose with prominent elongate papillae.

ON PINACEAE:
Pinus sylvestris L., Europe; not yet found in America.

II. Uredinia hypophyllous, thickly scattered, about 0.5 mm. across, early naked, bright orange-yellow fading to pale-yellow, ruptured epidermis evident; urediniospores elliptical-globoid or obovate-globoid, 17–21 by 20–27 μ; wall thin, 1–1.5 μ, evenly but not densely verrucose, with low papillae.

III. Telia hypophyllous, scattered, often confluent, small, 0.3 mm. across, brilliant orange-yellow fading to pale orange-yellow; teliospores with wall swelling 15–25 μ thick above; contents orange-yellow fading to pale yellow, clavate or clavate-oblong, 16–20 by 60–83 μ, rounded at both ends, or narrowed below.

ON CARDUACEAE:
Senecio vulgaris L., Rhode Island.
TYPE LOCALITY: Europe, on *Senecio sylvatica*.
DISTRIBUTION: Rhode Island, probably introduced; also in Europe.

2. **GALLOWAYA** Arth. Résult. Sci. Congr. Bot. Vienne 336. 1906.

Cycle of development includes only telia (and possibly pycnia). Telia subepidermal. Pycnia unknown (possibly not formed).

Telia erumpent, prominent, gelatinous, somewhat indefinite, usually oblong. Teliospores sessile, one-celled; wall smooth, colorless, thickened and gelatinous at apex.

Type species, *Coleosporium Pini* Gall. (on *Pinus inops*).

1. **Gallowaya Pini** (Gall.) Arth. Résult. Sci. Congr. Bot. Vienne 336. 1906.

Coleosporium Pini Gall. Jour. Myc. **7**: 44. 1891.

O. Pycnia unknown, probably wanting.

III. Telia amphigenous, on yellow spots, usually near the tips of the leaves, long covered by the epidermis, 1–5 mm. long, or when confluent up to 10 mm. or more, reddish-orange fading to pale-yellow or dirty-white, ruptured epidermis inconspicuous; teliospores with walls swelling 30–50 μ above, and soon disappearing upon exposure; contents orange-yellow fading to nearly colorless, clavate, slender, 13–20 by 60–100 μ, acute or rounded above, much narrowed below, sides wavy or irregular.

ON PINACEAE:
Pinus virginiana Mill. (*P. inops* Ait.), District of Columbia, Maryland, North Carolina, Tennessee, Virginia.
TYPE LOCALITY: Washington, D. C., on *Pinus inops*.
DISTRIBUTION: Maryland to Tennessee, nearly throughout the region of the host.
ILLUSTRATION: Bot. Gaz. **22**: *pl. 22, 23.*
EXSICCATI: Seym. & Earle, Econ. Fungi *222*.

Family 2. **UREDINACEAE**

By Joseph Charles Arthur

Basidia external. Telia forming a more or less definite crust or column; teliospores compacted laterally into layers, or rarely solitary within the tissues (*Uredinopsis*), sessile; wall firm, or rarely with an outer gelatinous layer.

Pycnia and other sori subcuticular or originating between the epidermis and mesophyl; telia indehiscent; teliospores compacted into dense layers forming a crust; aecia when present without peridium; uredinia when present without peridium, or with an imperfect one of paraphyses, the spores borne singly on pedicels. Subfamily Uredinatae.

Teliospores in a single layer; uredinia with paraphyses intermixed with the spores. 1. Uredo.

Teliospores in more than one layer.

Uredinia with peripheral paraphyses only. 2. Physopella.

Uredinia without paraphyses. 3. Bubakia.

Pycnia subcuticular, other sori originating between the epidermis and mesophyl, or telia within the epidermal cells, or between cells of mesophyl; telia indehiscent, teliospores divided by vertical partitions or one-celled, forming imperfect layers, or solitary; aecia when present with cylindrical peridium, rupturing irregularly above; uredinia when present with peridium, spores borne singly on pedicels. Subfamily Pucciniastratae.

Teliospores approximately in a single layer within or beneath the epidermis; urediniospores globoid to oblong.

Life-cycle with all spore-forms.

Walls of teliospores colored.

Urediniospores echinulate throughout. 4. Pucciniastrum.

Urediniospores echinulate except apex. 5. Melampsoridium.

Walls of teliospores colorless.

Urediniospores echinulate. 6. Melampsorella.

Urediniospores verrucose. 7. Hyalopsora.

Life-cycle with pycnia, aecia and telia; walls of teliospores colored. 8. Calyptospora.

Life-cycle with only telia known; walls of teliospores colored. 9. Necium.

Teliospores solitary within the mesophyl; urediniospores pointed. 10. Uredinopsis.

Pycnia and other sori originating beneath the epidermis; telia erumpent, teliospores catenulate, with colorless wall, compacted laterally; aecia when present with somewhat flattened peridium, rupturing apically; uredinia when present with delicate peridium (rarely absent) and catenulate spores. Subfamily Chrysomyxatae. 11. Melampsoropsis.

Pycnia and other sori originating beneath the epidermis; telia erumpent, with or without peridia, teliospores catenulate, compacted laterally, often adhering and extruded into long columns, one-celled, or two-celled by transverse septum, wall colorless or colored; aecia when present with inflated peridium, dehiscence circumscissile; uredinia when present with peridium, spores borne singly on pedicels. Subfamily Cronartiatae.

Life-cycle with all spore-forms, so far as known.

Telia forming columns. 12. Cronartium.

Telia not extruded into columns. 13. Cerotelium.

Life-cycle with only pycnia and telia.

Teliospores one-celled.

Telia in columns, peridia wanting.

Telial column long, teliospores alternating. 14. Cionothrix.

Telial column short, teliospores in transverse layers. 15. Alveolaria.

Telia not extruded.

Telia compact, peridia wanting. 16. Baeodromus.

Telia pulverulent, peridia evanescent. 17. Endophyllum.

Teliospores two-celled, peridia persistent. 18. Pucciniosira.

1. **UREDO** Pers. Neues Mag. Bot. Römer **1**: 93. 1794.

Melampsora Cast. Obs. **2**: 18. 1843.
Physonema Lév. Ann. Sci. Nat. III. **8**: 374. 1847.
Podosporium Lév. Ann. Sci. Nat. III. **8**: 374. 1847.
Podocystis Fries, Summa Veg. Scand. **2**: 512. 1849.
Caeoma Tul. Ann. Sci. Nat. IV. **2**: 172. 1854. Not *Caeoma* Link, 1809.

Cycle of development includes pycnia, aecia, uredinia and telia, with distinct alternating phases; heteroecious and autoecious. Pycnia and other sori subcuticular or subepidermal.

Pycnia conoidal or hemispherical, without ostiolar filaments; hymenium flat, or nearly so.

Aecia erumpent, without peridia or paraphyses. Aeciospores globoid; wall colorless, finely verrucose.

Uredinia erumpent, pulverulent, without peridium. Urediniospores borne singly on pedicels; wall colorless, verrucose. Paraphyses intermixed with the spores, numerous, capitate, large and thick-walled; peripheral paraphyses usually thinner-walled and less capitate.

Telia indehiscent, in waxy layers. Teliospores one-celled, closely compacted into a single layer, prismatic or ellipsoid; wall smooth, colored.

Type species, *Uredo Helioscopiae* Pers. (on *Euphorbia Helioscopia*).

Urediniospores smooth on the thickened sides.	1. *U. Medusae.*
Urediniospores without smooth spots.	
Urediniospores small.	
Walls thick, 2–3 μ.	2. *U. confluens.*
Walls medium, 1.5–2 μ.	3. *U. alpina.*
Walls thin, 1–1.5 μ.	4. *U. Rostrupiana.*
Urediniospores large.	
Walls thick, 2.5–3.5 μ.	5. *U. Bigelowii.*
Walls thin, 1.5–2 μ.	
Paraphyses clavate.	6. *U. albertensis.*
Paraphyses capitate.	7. *U. Lini.*

1. **Uredo Medusae** (Thüm.) Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Melampsora Medusae Thüm. Bull. Torrey Club **6**: 216. 1878.

O. Pycnia chiefly epiphyllous, scattered or somewhat gregarious, minute, punctiform, pale-yellow, inconspicuous, subcuticular, hemispherical, 40–80 μ in diameter, half as high.

I. Aecia chiefly hypophyllous, scattered or somewhat gregarious, small, 0.1–0.3 mm. broad, round or oblong, pale-yellow fading to white, inconspicuous, formed between epidermis and mesophyl, soon naked, pulverulent, ruptured epidermis noticeable; aeciospores globoid, 17–22 by 17–24 μ; wall colorless, thick, 2.5–3 μ, minutely verrucose, with minute, crowded papillae, pores indistinct.

ON PINACEAE:

Larix sp. Proven by cultures, but not yet collected.

II. Uredinia amphigenous, or only hypophyllous, scattered, roundish, small, 0.2–0.4 mm. across, early naked, somewhat pulverulent, orange-yellow, fading to pale brownish-yellow, ruptured epidermis usually inconspicuous; urediniospores ellipsoid or obovate-ellipsoid, 15–18 by 22–30 μ, usually flattened laterally; wall colorless, 2.5–3 μ, or up to 10 μ on the flattened sides, sparsely and evenly verrucose, with fine papillae, except on the flattened sides which are smooth; paraphyses numerous, intermixed with the spores, capitate, smooth, 40–65 μ long, head 14–25 μ broad, wall thick, 3–6 μ, peripheral paraphyses thinner-walled and more clavate.

III. Telia amphigenous, or only hypophyllous, scattered, or somewhat confluent, irregularly roundish, small, 0.2–0.4 mm. across, slightly elevated, light reddish-brown, becoming deep chocolate-brown, subepidermal; teliospores prismatic, 12–15 by 30–45 μ; wall smooth, cinnamon-brown, uniformly thin, 1 μ.

ON SALICACEAE:

Populus angustifolia James, Montana, Wyoming.
Populus balsamifera L., Montana.
Populus candicans Ait., Iowa, Montana, Wisconsin.
Populus deltoides Marsh. (*P. angulata* Ait., *P. canadensis* Moench, *P. Medusae* Benth., *P. monilifera* Ait., *P. virginiana* Dum.), Alabama, Illinois, Indiana, Iowa, Louisiana, Maine, Massachusetts, Mississippi, Missouri, New York, Ohio, South Carolina, Wisconsin.
Populus dilatata Ait. (*P. nigra italica* Duroi, *P. pyramidalis* Salisb., *P. italica* Moench), Pennsylvania.
Populus grandidentata Michx., Alabama, Indiana, New York, Ohio, Wisconsin; Nova Scotia.
Populus occidentalis (Rydb.) Britton, Iowa, Kansas, Nebraska, South Dakota.
Populus tremuloides Michx., Indiana, Montana, Ohio, Vermont, Wisconsin.
Populus trichocarpa T. & G., California, Idaho, Washington.

TYPE LOCALITY: Aiken, South Carolina, on *Populus angulata*.

DISTRIBUTION: Nearly throughout the United States, and northward.

EXSICCATI: Kellerm. Ohio Fungi *23, 45, 144, 145;* Carleton, Ured. Am. *7;* Griff. West Am. Fungi *369;* Thüm. Myc. Univ. *1137;* Ellis & Ev. Fungi Columb. *1067, 1068;* Ellis, N. Am. Fungi *1074, 1075b, 1075c.*

2. **Uredo confluens** Pers. Obs. Myc. **1**: 98. 1796.

Caeoma Ribesii Link, in Willd. Sp. Pl. 6^2: 26. 1825.
Caeoma Ribis-alpini Wint. in Rab. Krypt. Fl. 1^1: 258. 1881.
Caeoma confluens Schröt. Krypt. Fl. Schles. 3^1: 376. 1887.

O. Pycnia chiefly epiphyllous, in small orbicular groups, crowded, minutely punctiform, inconspicuous, subepidermal, somewhat hemispherical, or becoming conoidal, small, 80–160 μ broad, 50–65 μ high; hymenium flat; pycniospores ovoid.

I. Aecia hypophyllous, few in crowded groups on scarcely discolored spots, round, 0.3–0.8 mm. across, often confluent, soon naked, applanate, bright-yellow fading to pale-yellow, pulverulent, ruptured epidermis noticeable; aeciospores broadly ellipsoid or globoid, 16–19 by 22–26 μ; wall colorless, medium thick, 1.5–2.5 μ, closely and finely verrucose.

ON GROSSULARIACEAE:
Ribes saxosum Hook., Utah.
Ribes vallicola Greene, Colorado.

II. Uredinia chiefly hypophyllous, usually on noticeable yellow spots, scattered or in groups, small, 0.25–1 mm. across, round, pulvinate, pale orange-yellow; urediniospores globoid, rarely oval, 14–18 by 15–22 μ, wall thick, 2–3 μ, sparsely and evenly verrucose, with sharp papillae, pores scarcely noticeable; paraphyses capitate or clavate, heads 16–25 μ broad, 40–70 μ long, walls thick, 2.5–4 μ.

III. Telia amphigenous, scattered or in groups, often covering the entire surface, small, 0.25–0.5 mm. across, brownish, covered with the epidermis; teliospores irregularly prismatic, rounded at both ends, 7–11 by 20–35 μ, wall thin, scarcely 1 μ, light-brown, pores obscure.

ON SALICACEAE:
Salix sp. in Europe, not yet found in America.
TYPE LOCALITY: Europe, on *Ribes alpinum*.
DISTRIBUTION: Central Rocky Mountain region; also in Europe.

3. **Uredo alpina** (Juel) Arthur.

Melampsora alpina Juel, Öfv. K. Sv. Vet.-Akad. Förh. 1894^8: 417. 1894.

O. Pycnia amphigenous, numerous, scattered or in small groups, orange-red becoming chestnut-brown, subepidermal, low-conoidal, 150–210 μ in diameter by 30–45 μ high.

I. Aecia chiefly hypophyllous, scattered, irregular, 0.5–2 mm. across, orange-red fading to light-yellow, pulvinate, pulverulent, ruptured epidermis noticeable; aeciospores globoid or shortly ellipsoid, 18–21 by 21–26 μ, wall colorless, thick, 2.5–3.5 μ, finely and evenly verrucose.

ON SAXIFRAGACEAE:
Leptasea flagellaris (Willd.) Small (*Saxifraga flagellaris* Willd.), Colorado.
Saxifraga bracteata D. Don, Alaska.

II. Uredinia chiefly hypophyllous, scattered, round, 0.2–0.7 mm. across, orange-yellow fading to pale-yellow, pulvinate, pulverulent, ruptured epidermis inconspicuous; urediniospores globoid or broadly ellipsoid, 13–18 by 17–21 μ, wall colorless, 1.5–2 μ thick, sparsely and evenly verrucose, with fine papillae, pores not evident; paraphyses intermixed with the spores, capitate, smooth, 40–65 μ long, heads 18–27 μ broad, wall thick, 3–6 μ, peripheral paraphyses thinner-walled and more clavate.

III. Telia amphigenous, scattered or sometimes confluent in groups, round, 0.2–0.6 mm. across, chestnut-brown, slightly elevated, subepidermal; teliospores prismatic or oblong, 9–13 by 25–40 μ, rounded at each end; wall pale golden-brown, smooth, uniformly thin, 1 μ.

ON SALICACEAE:
Salix fuscescens Anders., Alaska.
Salix polaris Wahl., Alaska.
TYPE LOCALITY: Grjotli, Norway, on *Salix herbacea*.
DISTRIBUTION: Summit of Pike's Peak, Colorado, and boreal region of Alaska; also in Europe.
ILLUSTRATION: Beitr. Krypt. Schweiz 2^2: *f. 314*.

4. **Uredo Rostrupiana** Arthur.

Melampsora arctica Rostr. Medd. Grønland **3**: 535. 1888. Not *Uredo arcticus* Lagerh. 1889.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, or only hypophyllous, scattered, round, very small, 0.1–0.2 mm. across, early naked, orange-yellow fading to pale-yellow, somewhat pulverulent, ruptured epidermis usually inconspicuous; urediniospores ellipsoid or obovate, small, 13–16 by 16–20 μ; wall colorless, thin, 1–1.5 μ, uniformly and rather closely verrucose, with fine papillae, pores obscure; paraphyses intermixed with the spores, capitate, smooth, 55–60 μ long, heads 17–24 μ broad, wall very thick, 3–7 μ, peripheral paraphyses thinner-walled and more clavate.

III. Telia amphigenous, or only hypophyllous, scattered, roundish or irregular, about 0.3 mm. across, often confluent, scarcely elevated, reddish-brown becoming dull-brown, subepidermal; teliospores prismatic or oblong, 9–14 by 29–38 μ, rounded at both ends; wall smooth, cinnamon-brown, very thin, about 0.5 μ, slightly thickened above, 1 μ.

ON SALICACEAE:
Salix glauca L., Greenland.
Salix groenlandica (Anders.) Lundst., Greenland.
Salix herbacea L., New Hampshire; Greenland.
TYPE LOCALITY: Christianshaab, Greenland, on *Salix groenlandica*.
DISTRIBUTION: Arctic and alpine regions of northeastern America.

5. **Uredo Bigelowii** (Thüm.) Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Melampsora Bigelowii Thüm. Mitth. Forstl. Vers. Oest. **2**: 37. 1879.
Lecythea macrosa Peck, Bot. Gaz. **5**: 35. 1880.
Melampsora paradoxa Dietel & Holway, Hedwigia Beibl. **40**: 32. 1901.

O. Pycnia amphigenous, scattered, or somewhat gregarious, minute, punctiform, pale-yellow, inconspicuous, subcuticular, conical, 60–80 μ in diameter, 40–50 μ high.

I. Aecia chiefly hypophyllous, scattered or somewhat gregarious, small, 0.1–0.2 mm. across, oblong, pale-yellow fading to white, inconspicuous, formed between epidermis and mesophyl, soon naked, pulverulent, ruptured epidermis somewhat noticeable; aeciospores globoid, 15–22 by 18–27 μ; wall colorless, thick, 2–3 μ, finely and evenly verrucose, with distinct papillae, pores scattered, noticeable.

ON PINACEAE:
Larix Lyallii Parl., Alberta.

II. Uredinia chiefly hypophyllous, usually on conspicuous yellow spots, scattered or gregarious, round, 0.3–0.5 mm. across, orange-yellow fading to pale-yellow, soon naked, somewhat pulverulent, ruptured epidermis usually inconspicuous; urediniospores globoid, 15–19 by 17–24 μ; wall colorless, thick, 2.5–3.5 μ, sparsely and evenly verrucose, with fine papillae, pores scattered, evident; paraphyses intermixed with the spores, capitate, smooth, 50–70 μ long, heads 22–25 μ broad, wall thick, 3–5 μ, peripheral paraphyses thinner-walled and more clavate.

III. Telia amphigenous, or sometimes partly or wholly epiphyllous or hypophyllous, scattered, roundish or irregular, about 0.5 mm. across, often confluent, slightly elevated, orange-yellow, becoming yellowish- or purplish-brown, subepidermal; teliospores prismatic or oblong, 11–14 by 29–42 μ, rounded at both ends; wall cinnamon-brown, smooth, uniformly thin, 1 μ.

ON SALICACEAE:
Salix alaxensis (Anders.) Cov., Alaska.
Salix amygdaloides Anders., Indiana, Iowa, Kansas, Montana, Nebraska, New York, Ohio, South Dakota, Wisconsin.
Salix Bebbiana Sarg. (*S. rostrata* Rich.), Colorado, Montana, Wisconsin.
Salix bella Piper, Washington.
Salix Bigelowii Ait., California.
Salix cordata Muhl., Maine, New York, Ohio.
Salix cordata angustata (Pursh) Anders., Colorado, Indiana, Kansas, Montana, Nebraska, Utah, Vermont, Wisconsin.
Salix discolor Muhl., Indiana, Michigan, Minnesota, Wisconsin.
Salix eriocephala Michx., Maine.

Salix exigua Nutt., Washington.
Salix Fendleriana Anders., Utah, Washington.
Salix fluviatilis Nutt., Montana, Wyoming.
Salix Geyeriana Anders., Colorado.
Salix glauca L., Colorado.
Salix glaucops Anders., Colorado; Alberta.
Salix Humboldtiana Willd., Guatemala.
Salix interior Rowl. (*S. longifolia* Muhl.), Indiana.
Salix irrorata Anders., Colorado.
Salix lasiandra Benth., California.
Salix longipes Shuttlw. (*S. Wardii* Bebb), Florida, Indiana.
Salix lucida Muhl., Maine.
Salix lutea Nutt., Montana, Wyoming.
Salix luteosericea Rydb., Iowa, Kansas, Montana.
Salix Mackenzieana Barratt, Alberta.
Salix melanopsis Nutt., Montana.
Salix missouriensis Bebb, Kansas.
Salix myrtilloides L., Minnesota.
Salix nigra Marsh., Alabama, Delaware, Indiana, Iowa, Louisiana, Nebraska, New York, Ohio, South Carolina, Virginia, West Virginia.
Salix padophylla Rydb., Colorado.
Salix perrostrata Rydb., Colorado, Nebraska.
Salix petiolaris J. E. Smith, New York.
Salix petrophila Rydb., Alberta.
Salix pulchra Cham., Alaska.
Salix reticulata L., Alaska.
Salix stolonifera Cov., Alaska.
Salix Watsoni (Bebb) Rydb., Colorado, Wyoming.

TYPE LOCALITY: California, on *Salix Bigelowii*.
DISTRIBUTION: Nearly throughout continental North America.
EXSICCATI: Ellis & Ev. Fungi Columb. *355*, *1544*, *1545*, *1937*, *1938*, *2041*; Kellerm. Ohio Fungi *46*, *47*, *166*; Griff. West Am. Fungi *341*; Clements, Crypt. Form. Colo. *148*; Sydow, Ured. *1099*; Ellis, N. Am. Fungi *1484*.

6. **Uredo albertensis** Arthur.

Melampsora albertensis Arth. Bull. Torrey Club **33**: 517. 1906.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, numerous, scattered, round, 0.2–0.4 mm. across, early naked, pulverulent, pale-yellow, ruptured epidermis noticeable; paraphyses numerous, intermixed with the spores, clavate, 9–15 by 67–90 μ, wall colorless, 3–5 μ thick, smooth, stipe solid; urediniospores flattened laterally, when seen from the broad side broadly-elliptical, 16–19 by 23–27 μ, when seen from the narrow side oblong, 13–15 by 23–27 μ; wall colorless, 1.5–2 μ, much thickened on the flattened sides, 2.5–3.5 μ, evenly and sparsely verrucose-echinulate, without smooth spots.

III. Telia hypophyllous, numerous, small, irregular, often confluent, usually crowded in more or less extensive groups about the uredinia, subepidermal, waxy, orange-brown; teliospores prismatic, 10–13 by 29–39 μ; wall golden-brown, smooth, thin, about 1 μ, thicker above, 2–3 μ, with an evident apical pore.

ON SALICACEAE:
Populus tremuloides Michx., Alberta.
TYPE LOCALITY: Moraine Lake, Laggan, Alberta, on *Populus tremuloides*.
DISTRIBUTION: Canadian Rocky Mountains.

7. **Uredo Lini** Schum. Enum. Pl. Saell. **2**: 230. 1803.

Uredo miniata β *Lini* Pers. Syn. Fung. 216. 1801.
Hypodermium (*Uredo*) *Lini* Link, Ges. Nat. Freunde Berlin Mag. **7**: 28. 1815.
Xyloma Lini Ehrenb. Sylvae Myc. Berol. 27. 1818.
Podosporium Lini Lév. Ann. Sci. Nat. III. **8**: 374. 1847.
Podocystis Lini Fries, Summa Veg. Scand. 512. 1849.
Melampsora Lini Desmaz. Pl. Crypt. (Fasc. 41) *2049*. 1850.

O. Pycnia amphigenous, numerous, scattered, inconspicuous, subepidermal, pale-yellow, flattened globoid or lens-shaped, 100–175 μ in diameter, 65–95 μ high; pycniospores ellipsoid, 2–3 by 3–4 μ.

I. Aecia chiefly hypophyllous, numerous, scattered, rounded, 0.2–0.4 mm. across, bright orange-yellow, conspicuous, formed between epidermis and mesophyl, soon naked, ruptured epidermis evident; aeciospores globoid, 19–27 by 21–28 μ; wall colorless, thin, about 1 μ, finely and evenly verrucose, with distinct papillae, pores not evident.

II. Uredinia amphigenous and caulicolous, scattered or somewhat gregarious, often crowded, round or on stem elongate, 0.3–0.5 mm. across, soon naked, reddish-yellow fading to nearly white, pulverulent, ruptured epidermis noticeable; urediniospores broadly elliptical or obovate, 13–18 by 15–25 μ, wall colorless, rather thin, 2 μ, evenly and finely verrucose, with low papillae, pores equatorial, obscure; paraphyses intermixed with the spores, capitate, large, 15–22 by 40–65 μ, smooth, wall thick.

III. Telia amphigenous and caulicolous, scattered, often confluent, round or elongate, 0.2–0.5 mm. across, slightly elevated, reddish-brown becoming blackish; teliospores subepidermal, appressed into a single layer, prismatic, 1-celled, 10–20 by 42–50 μ; wall brown, smooth, thin, about 1 μ, not thickened above.

ON LINACEAE:
Linum Breweri A. Gray, California.
Linum congestum A. Gray, California.
Linum drymarioides Curran, California.
Linum Lewisii Pursh (*L. perenne* Nutt.), Arizona, California, Colorado, Montana, Nebraska, Nevada, New Mexico, Oregon, Utah, Wyoming.
Linum rigidum Pursh, Kansas, Montana, Nebraska.
Linum sulcatum Ridd., Iowa, Wisconsin.
Linum usitatissimum L., Iowa, North Dakota; Ontario.

TYPE LOCALITY: Island of Zealand, Denmark, on *Linum catharticum*.

DISTRIBUTION: Throughout the northern United States and Canada, and southward in the Rocky Mountains; also in South America, Australia, and Europe.

EXSICCATI: Seym. & Earle, Econ. Fungi *B 6;* Ellis & Ev. N. Am. Fungi *3567;* Griff. West Am. Fungi *249, 249a;* Ellis & Ev. Fungi Columb. *1118, 1832;* Sydow, Ured. *1846, 1949*.

EXCLUDED SPECIES

Melampsora Liquidambaris Cooke, Grevillea **6**: 138. 1898. On *Liquidambar Styraciflua* L. Some *fungus imperfectus*, possibly a *Phoma*.

2. **PHYSOPELLA** Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Cycle of development imperfectly known; only uredinia and telia recognized, both subepidermal.

Uredinia erumpent, definite, roundish, pulverulent, encircled by more or less clavate paraphyses, often united by their bases, or wholly, into a pseudoperidium opening by a central pore. Urediniospores borne singly on pedicels, obovate-globoid or ellipsoid; wall pale-yellow, echinulate, or rarely verrucose, pores obscure.

Telia indehiscent, forming lenticular masses, two or more cells thick at center. Teliospores one-celled; walls smooth.

Type species, *Uredo Vitis* Thüm. (on *Vitis vinifera*).

Urediniospores echinulate.
  Paraphyses free.
    Paraphyses incurved, hyphoid, firm. 1. *P. Vitis.*
    Paraphyses incurved, clavate, thick-walled. 2. *P. ficina.*
    Paraphyses erect, hyphoid, delicate. 3. *P. Fici.*
  Paraphyses compressed into a pseudoperidium. 4. *P. Artocarpi.*
Urediniospores minutely verrucose; paraphyses imbricated into a pseudoperidium. 5. *P. Aeschynomenis.*

1. **Physopella Vitis** (Thüm.) Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Uredo Vitis Thüm. Pilze Weinst. 182. 1878.
Uredo Vialae Lagerh. Compt. Rend. Acad. Sci. Paris **110**: 729. 1890.
Uredo Viticis Juel, Bih. K. Sv. Vet.-Akad. Handl. **23(3)**[10]: 26. 1897.
Phakopsora Vitis Sydow, Hedwigia Beibl. **38**: 141. 1899.

II. Uredinia hypophyllous, scattered thickly over wide areas, round, minute, 0.1 mm. or less across, soon naked, arising between epidermis and mesophyl, surrounded by numerous incurved paraphyses, pulverulent, pale-yellow, fading to dirty-white, ruptured epidermis inconspicuous; urediniospores broadly ellipsoid or obovate, 13–17 by 18–27 μ; wall nearly colorless, thin, 1 μ, minutely and rather closely echinulate, pores obscure; paraphyses hyphoid, curved and irregular, 6–10 μ thick, 30–60 μ long, wall uniformly thin, 1 μ, yellowish.

III. Telia hypophyllous, scattered thickly over large areas, roundish, minute, 0.1–0.2 mm. across, indehiscent, 3–4 cells thick; teliospores ovoid, 12–15 by 20–30 μ, wall smooth, nearly colorless, thin, 1 μ or less.

ON VITACEAE:
Vitis vinifera L., Florida, South Carolina; Cuba; Jamaica.
TYPE LOCALITY: Aiken, South Carolina, on *Vitis vinifera*.
DISTRIBUTION: Southeastern United States and West Indies; also in South America and Japan.

2. **Physopella ficina** (Juel) Arthur.

Uredo ficina Juel, Bih. K. Sv. Vet.-Akad. Handl. **23**(3)[10]: 25. 1897.

II. Uredinia hypophyllous, scattered thickly over large areas, roundish, small, 0.1–0.3 mm. across, bullate, tardily dehiscent by a central rupture, encircled by firm, persistent paraphyses, orange-brown, ruptured epidermis overarching or erect; urediniospores broadly ellipsoid or obovate-globoid, 20–23 by 23–32 μ; wall very pale-brown, thin, about 1 μ, echinulate with prominent blunt papillae, 2–3 μ apart, pores obscure; paraphyses incurved, deformed, somewhat clavate, 50–65 μ long, wall pale-brown, 2–4 μ thick, uneven, often almost obliterating the lumen.

III. Telia unknown.

ON ARTOCARPACEAE:
Ficus aurea Nutt., Florida; Guatemala.
TYPE LOCALITY: San Antonio, Paraguay, on *Ficus* sp.
DISTRIBUTION: Southern Florida and Central América; also in South America.
ILLUSTRATION: Juel, *loc. cit. pl. 4, f. 36, 37.*

3. **Physopella Fici** (Cast.) Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Uredo Fici Cast.; Desmaz. Pl. Crypt. (Fasc. 34) *1662*. 1848.
Uredo Citri Cooke, Grevillea **6**: 138. 1878.
Uredo ficicola Speg. Anal. Soc. Ci. Argent. **17**: 120. 1884.
Uredo citrina De-Toni, in Sacc. Syll. Fung. **7**: 845. 1888.

II. Uredinia hypophyllous, scattered thickly over large areas, roundish, usually small, 0.1–0.3 mm. across, or rarely larger, bullate, arising between epidermis and mesophyl, tardily dehiscent by central rupture, encircled by delicate, evanescent paraphyses, pulverulent, pale cinnamon-brown, ruptured epidermis overarching or erect; urediniospores obovate-globoid, 14–20 by 18–27 μ; wall pale-yellow, thin, 1–1.5 μ, sharply and rather sparsely echinulate, pores obscure; paraphyses hyphoid, very delicate, collapsing, 60–80 μ long, wall colorless, very thin, slightly thickened at apex, 1 μ.

III. Telia unknown.

ON ARTOCARPACEAE:
Ficus Carica L., Alabama, Florida, Louisiana, Mississippi, South Carolina, Texas; Cuba; Porto Rico.
Toxylon pomiferum Raf. (*Maclura aurantiaca* Nutt.), Louisiana, South Carolina.
TYPE LOCALITY: France, on *Ficus* sp.
DISTRIBUTION: South Carolina to Texas, south into West Indies; also in South America and Europe.
EXSICCATI: Seym. & Earle, Econ. Fungi *211;* Ellis, N. Am. Fungi *1080.*

4. **Physopella (?) Artocarpi** (B. & Br.) Arthur.

Uredo Artocarpi B. & Br. Jour. Linn. Soc. Bot. **14**: 93. 1873.

II. Uredinia hypophyllous, thickly scattered over wide areas, or somewhat gregarious, bullate, round, small, 0.1–0.2 mm. across, arising between epidermis and mesophyl, enclosed by colorless paraphyses united into a pseudoperidium, dehiscent by central pore, overarching epidermis persistent; urediniospores ovate-globoid, 16–19 by 21–26 μ; wall pale-yellow, thin, 1 μ, rather closely echinulate, pores obscure; paraphyses colorless, delicate, hyphoid at the sides of the sorus, forming a membrane with polygonal cells above.

III. Telia unknown.

ON ARTOCARPACEAE:
Artocarpus communis Forst., Porto Rico.
TYPE LOCALITY: Ceylon, on *Artocarpus Lakoocha*.
DISTRIBUTION: West Indies; also in India.

5. **Physopella (?) Aeschynomenis** Arthur.

Uredo Aeschynomenis Arth. Bot. Gaz. **39**: 392. 1905.

II. Uredinia mostly hypophyllous, scattered, or grouped on small reddish spots, subepidermal, small, globose, surrounded by small paraphyses having their slender bases united into a firm pseudoperidium and the capitate ends internal, opening by a central pore; urediniospores broadly elliptical or globoid, 14–18 by 16–23 μ; wall pale-yellow, thin, 1 μ, very minutely verrucose, pores small, obscure, about 6, scattered; paraphyses imbricated, colorless, 10–14 μ broad above where the wall is much thickened.

III. Telia unknown.

ON FABACEAE;
Aeschynomene americana L., Morelos.
TYPE LOCALITY: Cuautla, Mexico, on *Aeschynomene americana*.
DISTRIBUTION: Known only from the type locality.

3. **BUBAKIA** Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Cycle of development imperfectly known; only uredinia and telia recognized, both subepidermal, but judging from analogy also possessing pycnia and aecia, and heteroecious.

Uredinia erumpent, pulverulent, without peridium or paraphyses. Urediniospores borne singly on pedicels, obovate; wall pale-yellow, echinulate, pores obscure.

Telia indehiscent, compacted into dense masses, several cells thick. Teliospores one-celled; wall colored, smooth, thin, or the uppermost thicker above.

Type species, *Melampsora Crotonis* Burrill (on *Croton capitatus*).

Urediniospores with uniformly thin wall. 1. *B. Crotonis.*
Urediniospores with wall medium thick, thicker above. 2. *B. mexicana.*

1. **Bubakia Crotonis** (Cooke) Arth. Résult. Sci. Congr. Bot. Vienne 339. 1906.

Trichobasis Crotonis Cooke, Grevillea **6**: 137. 1878.
Melampsora Crotonis Burrill, Bot. Gaz. **9**: 189. 1884.
Pucciniastrum Crotonis De-Toni, in Sacc. Syll. Fung. **7**: 763. 1888.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, round, about 0.5 mm. across, soon dehiscent, cinnamon-brown, pulverulent, ruptured epidermis overarching or erect, rather inconspicuous; urediniospores obovate, 16–21 by 22–32 μ; wall yellowish, rather thin, 1–1.5 μ, closely echinulate with short points, pores few, obscure.

III. Telia amphigenous and caulicolous, at first arising about the uredinia, soon independent, scattered, irregularly orbicular, confluent, 0.5–1.5 mm. across, noticeably elevated, indehiscent, chocolate-brown or blackish; teliospores united in a compact mass, appearing obscurely catenulate with 3–7 cells in a series, each spore elliptical or cuboidal, 10–15 by 24–40 μ, outermost longest; wall smooth, cinnamon-brown, 3–4 μ thick, apical wall of outer spores 7–9 μ.

ON EUPHORBIACEAE:
Croton argyranthemus Michx., Florida.
Croton californicus Muell. Arg., California.
Croton capitatus Michx., Illinois, Mississippi, Missouri.
Croton monanthogynus Michx., Alabama, Illinois, Indiana, Kansas, Louisiana, Missouri.
Croton punctatus Jacq. (*C. maritimus* Walt.), Florida.
Croton texensis (Kl.) Muell. Arg., Kansas, Nebraska, Texas.
Crotonopsis linearis Michx., Florida, Illinois.
TYPE LOCALITY: California, on "*Croton procumbens*," error for *C. californicus*.
DISTRIBUTION: Indiana to Kansas south to Florida and Texas, also from central to southern California along the coast.
EXSICCATI: Sydow, Ured. *942, 1838;* Ellis, N. Am. Fungi *1079;* Ellis & Ev. N. Am. Fungi *1877;* Ellis & Ev. Fungi Columb. *200, 1872;* Rab.-Wint.-Paz. Fungi Eur. *3808.*

2. **Bubakia mexicana** Arthur, sp. nov.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, round, about 0.5 mm. across, soon dehiscent, cinnamon-brown, pulverulent, ruptured epidermis overarching or erect, rather inconspicu-

ous; urediniospores obovate, 20–24 by 27–35 μ; wall golden-yellow, medium thick, 2–2.5 μ, much thicker above, 5–8 μ, evenly and strongly echinulate, pores apparently equatorial, few, obscure.

III. Telia amphigenous, scattered, irregularly orbicular, confluent, 0.5–1 mm. across, very slightly elevated, indehiscent, dirty-brown; teliospores united in a compact mass, appearing obscurely catenulate, with 2–4 cells in a series, each spore elliptical or cuboidal, 10–15 by 18–35 μ, outermost but slightly longer; wall smooth, cinnamon-brown, 2–3 μ thick, apical wall of outer spores 7–9 μ.

ON EUPHORBIACEAE:
Croton calvescens S. Wats., Michoacan.
Croton sp., San Luis Potosi.
Type collected at Cardenas, Mexico, on *Croton* sp., October 22, 1898, *E. W. D. Holway 3144*.
DISTRIBUTION: Central Mexico.

4. PUCCINIASTRUM Otth, Mitth. Nat. Ges. Bern **1861**: 71. 1861.

Phragmopsora Magn. Hedwigia **14**: 123. 1875.
Thekopsora Magn. Hedwigia **14**: 123. 1875.

Cycle of development includes pycnia, aecia, uredinia and telia, with distinct alternating phases; heteroecious. Pycnia subcuticular, uredinia subepidermal, telia within or below the epidermis.

Pycnia subcuticular, low-conoidal, without ostiolar filaments.

Aecia erumpent, cylindrical. Peridium delicate, verrucose on inner surface. Aeciospores ellipsoid, verrucose except one side which is thinner and smooth.

Uredinia barely protruding through the epidermis, dehiscent by a central pore. Peridium hemispherical, delicate, cells longer at orifice. Urediniospores borne singly on pedicels, obovate to ellipsoid; wall colorless, echinulate, pores indistinct.

Telia indehiscent, forming more or less evident layers in the epidermal cells, or immediately beneath the epidermis. Teliospores oblong or prismatic, two to four-celled by vertical partitions in two planes; wall smooth, colored.

Type species, *Pucciniastrum Epilobii* Otth. (on *Epilobium angustifolium*).

Telia and uredinia inhabiting monocotyledonous hosts (Orchidaceae).	1. *P. Goodyerae.*
Telia and uredinia inhabiting dicotyledonous hosts.	
Host belonging to family Hydrangeaceae.	2. *P. Hydrangeae.*
Host belonging to family Rosaceae.	
Urediniospores broadly obovate.	3. *P. Agrimoniae.*
Urediniospores narrowly obovate.	4. *P. arcticum.*
Host belonging to family Onagraceae.	5. *P. pustulatum.*
Host belonging to family Pyrolaceae.	6. *P. Pyrolae.*
Host belonging to family Ericaceae.	
Urediniospores clavate-oblong.	7. *P. sparsum.*
Urediniospores obovate-oblong.	8. *P. minimum.*
Host belonging to family Vacciniaceae.	9. *P. Myrtilli.*

1. Pucciniastrum Goodyerae (Tranz.) Arthur.

Uredo Goodyerae Tranz. Trudi S. Peterb. Obshch. Est. Otd. Bot. **23**: 28. 1893.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, pustular, indefinitely scattered, round, 0.2–0.4 mm. across, dehiscent by central pore; peridium hemispherical, firm, cells large, elongated vertically, walls thin, 2 μ, gradually thickened below toward the orifice, smooth, ostiolar cells 35–40 μ high, greatly thickened below, finely echinulate above; urediniospores oblong-clavate or obovate, 13–19 by 26–36 μ; wall thin, 2 μ, pale-yellow, finely echinulate.

III. Telia unknown.

ON ORCHIDACEAE:
Peramium Menziesii (Lindl.) Morong (*Goodyera Menziesii* Lindl.), California, Colorado, Washington.
TYPE LOCALITY: Levashov near St. Petersburg, Russia, on *Goodyera repens*.
DISTRIBUTION: Colorado to northern California and northward; also in European Russia.
EXSICCATI: Sydow, Ured. *1798*.

2. **Pucciniastrum Hydrangeae** (B. & C.) Arth. Résult. Sci. Congr. Bot. Vienne 337. 1906.

Uredo Hydrangeae B. & C.; Seym. Bot. Gaz. **9**: 191. 1884.
Melampsora Hydrangeae Farl.; Farl. & Seym. Host Index N. Am. Fungi 200. 1891.
Coleosporium Hydrangeae Snyder, Proc. Ind. Acad. Sci. **1896**: 218. 1897.
Thecopsora Hydrangeae Magn.; Vesterg. Micr. Rar. Sel. *571*. 1902.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, round, small, 0.1–0.2 mm. across, dark-yellow fading to pale-yellow, ruptured epidermis, inconspicuous, dehiscent by a central pore; peridium hemispherical, delicate, cells small, cuboid, walls uniformly thin, 1–1.5 μ, ostiolar cells slightly or not elongate, 10–16 μ, barely pointed, walls thin, smooth; urediniospores broadly elliptical or obovate, 12–18 by 16–24 μ; wall nearly colorless, thin, 1–1.5 μ, sparsely and strongly echinulate.

III. Telia amphigenous, or chiefly epiphyllous, effused, or confluent into small angular groups, 0.3–0.8 mm. across, not raised, reddish-brown; teliospores forming a single layer within the epidermal cells, or sometimes between the epidermis and mesophyl, globoid, 22–28 by 24–28 μ; wall dark cinnamon-brown, uniformly thin, 1.5–2 μ.

ON HYDRANGEACEAE:
Hydrangea arborescens L., District of Columbia, Illinois, Indiana, North Carolina, Virginia, West Virginia.
TYPE LOCALITY: Cobden, Illinois, on *Hydrangea arborescens*.
DISTRIBUTION: Illinois and District of Columbia south to North Carolina.
EXSICCATI: Rab.-Wint. Fungi Eur. *3631*; Ellis & Ev. N. Am. Fungi *1884*; Seym. & Earle, Econ. Fungi *206*; Vesterg. Micr. Rar. Sel. *571*.

3. **Pucciniastrum Agrimoniae** (Schw.) Tranz. Scripta Bot. Hort. Univ. Petrop. **4**: 301. 1895.

Caeoma (*Uredo*) *Agrimoniae* Schw. Trans. Am. Phil. Soc. II. **4**: 291. 1832.
Coleosporium ochraceum Bon. Coniom. 20. 1860.
Uredo Agrimoniae-Eupatoriae Wint. in Rab. Krypt. Fl. 1[1]: 252. 1881.
Thecopsora Agrimoniae Dietel, Hedwigia **29**: 153. 1890.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, thickly scattered over definite or extended areas, bullate, round, small, 0.1–0.2 mm. across, orange-yellow fading to pale-yellow, dehiscent by a central pore, somewhat pulverulent, ruptured epidermis inconspicuous; peridium rather delicate, hemispherical, cells small, cuboid, walls thin, 2 μ, thicker below toward the orifice, smooth, ostiolar cells larger, irregular oblong, 20–25 μ high, thick-walled, 3–5 μ, minutely echinulate or smooth above; urediniospores broadly obovate, or globoid, 12–17 by 15–24 μ; wall colorless, thin, 1 μ, minutely echinulate; contents orange-yellow fading to pale-yellow.

III. Telia hypophyllous, diffused, forming irregular patches, indehiscent; teliospores beneath the epidermal cells, intercellular, oblong or cuneate, 15–30 by 18–30 μ; wall smooth, brownish-yellow; contents colorless.

ON ROSACEAE:
Agrimonia Brittoniana Bickn., Maine, Nebraska, North Dakota, Pennsylvania, Vermont.
Agrimonia hirsuta (Muhl.) Bickn. (*A. Eupatoria* Walt.), Illinois, Iowa, Minnesota, Nebraska, New York, Vermont.
Agrimonia incisa T. & G., North Carolina.
Agrimonia mollis (T. & G.) Britton, Indiana, Iowa, Massachusetts, Missouri, New York, Ohio, West Virginia.
Agrimonia parviflora Sol., Alabama, Illinois, Indiana, New Jersey, New York, Ohio, Pennsylvania, West Virginia.
Agrimonia pumila Muhl., Florida, Missouri.
Agrimonia sp., New Mexico; Mexico (state).
TYPE LOCALITY: North Carolina, on *Agrimonia* sp.
DISTRIBUTION: Vermont to North Dakota southward to Florida and Mexico; also in South America, Europe and Asia.
ILLUSTRATION: Bot. Mag. Tokyo **12**: *pl. 2, f. 1–6*.
EXSICCATI: Ellis, N. Am. Fungi *274*; Kellerm. Ohio Fungi *116, 177*; Ellis & Ev. Fungi Columb. *760*.

4. **Pucciniastrum arcticum** (Lagerh.) Tranz. Scripta Bot. Hort. Univ. Petrop. **4**: 300. 1895.

Uredo arcticus Lagerh. Hedwigia **28**: 109. 1889.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, thickly scattered over definite or extended areas, round, small, 0.1–0.2 mm. across, orange-yellow fading to pale-yellow, dehiscent by a central pore, slightly pulverulent, ruptured epidermis inconspicuous; peridium firm, cells somewhat elongate vertically, walls thin above, 2–3 μ, much thickened below especially toward the orifice, smooth, ostiolar cells larger, 35–45 μ high, greatly thickened below, coarsely echinulate above; urediniospores obovate or obovate-oblong, 13–16 by 21–26 μ; wall colorless, rather thin, 1–2 μ, noticeably echinulate, with low points.

III. Telia hypophyllous, brownish, flat, small; teliospores intercellular, globoid or cuboid, 19–25 μ in diameter; wall brownish, smooth.

ON ROSACEAE:
Rubus stellatus Smith, Alaska.
TYPE LOCALITY: Lulea, Sweden, on *Rubus arcticus*.
DISTRIBUTION: Alaska; also in northern Sweden and Russia.

5. **Pucciniastrum pustulatum** (Pers.) Dietel, in E. & P. Nat. Pfl. 1^{1**}: 47. 1897.

Uredo pustulata Pers. Syn. Fung. 219. 1801.
Uredo pustulata α *Epilobii* Pers. Syn. Fung. 219. 1801.
Uredo Epilobii DC. Fl. Fr. **6**: 73. 1815.
Caeoma Epilobii Link, in Willd. Sp. Pl. 6^2: 29. 1825.
Pucciniastrum Epilobii Otth, Mitth. Nat. Ges. Bern **1861**: 72. 1861.
Melampsora Epilobii Fuckel, Symb. Myc. 44. 1869.
Phragmopsora Epilobii Magn. Hedwigia **14**: 123. 1875.
Melampsora pustulata Schröt. Krypt. Fl. Schles. 3^1: 364. 1887.
Pucciniastrum Abieti-Chamaenerii Kleb. Jahrb. Wiss. Bot. **34**: 387. 1900.

O. Pycnia hypophyllous, subcuticular, abundant, inconspicuous, flattened, slightly conoidal, 50–110 μ broad, 20–30 μ high, extending slightly into the lateral walls of the epidermis.

I. Aecia hypophyllous, mostly in two rows, cylindrical, 0.3 mm. diameter, 1 mm. high, dehiscent at apex, or also by side slits; peridium colorless, cells slightly overlapping, walls thin, outer smooth, inner finely verrucose; aeciospores obovate or irregularly globoid, 10–14 by 13–21 μ; wall colorless, an elongate spot smooth on one side, remainder finely verrucose, thin, from 1 μ thick on smooth side to 1.5 μ on opposite side.

ON PINACEAE:
Abies pectinata DC., Europe; not yet recognized in America.

II. Uredinia hypophyllous, scattered or in small groups, small, 0.1–0.2 mm. across, bullate, round, dehiscent by central pore, yellowish-red fading to pale-yellow, somewhat pulverulent, long covered by overarching epidermis; peridium hemispherical, delicate, cells cuboidal, walls uniformly thin, 2 μ, smooth, ostiolar cells scarcely larger, 10–12 μ, slightly pointed, wall thin, 2–3 μ, smooth; urediniospores obovate or oval, 10–14 by 13–23 μ; wall colorless, thin, 1 μ, sparsely and finely echinulate; contents orange-yellow when fresh.

III. Telia hypophyllous, indehiscent, flat, small, 0.3 mm. across, scattered, sometimes gregarious and confluent, reddish-brown becoming blackish-brown; teliospores nearly in one layer, occasionally one above another, oblong or angular by pressure, 10–14 by 17–35 μ, walls chestnut-brown, smooth, thin, 1 μ, thicker at apex, 2–3 μ.

ON ONAGRACEAE:
Chamaenerion angustifolium (L.) Scop. (*Epilobium angustifolium* L., *E. spicatum* Lam.), Colorado, Idaho, Michigan, Montana, New Hampshire, New Jersey, New York, South Dakota, Vermont, Washington, Wisconsin; New Brunswick; Newfoundland.
Epilobium adenocaulon Haussk., California, Colorado, Maine, Montana, Nebraska.
Epilobium adenocaulon occidentale Trel., California.
Epilobium alpinum L., Colorado.
Epilobium anagallidifolium Lam., Montana.
Epilobium coloratum Muhl., California, Delaware, Iowa, Nebraska, New York; Ontario.
Epilobium hirsutum L., New York; Ontario.
Epilobium holosericeum Trel., California.
Epilobium lineare Muhl. (*E. palustre lineare* A. Gray), Minnesota, Wisconsin.

Epilobium paniculatum Nutt., Montana.
Epilobium sp., Alaska.
TYPE LOCALITY: Europe, on *Epilobium montanum*.
DISTRIBUTION: Delaware to Nebraska and central California, northward into Canada and Alaska; also in Europe.
ILLUSTRATION: Zeits. Pflanzenkr. **9**: 25. *f. 2*.
EXSICCATI: Ellis, N. Am. Fungi *1076*; Ellis & Ev. Fungi Columb. *267*; Griff. West Am. Fungi *242*.

6. **Pucciniastrum Pyrolae** (Pers.) Dietel, in E. & P. Nat. Pfl. 1^{1**}: 47. 1897.

Aecidium Pyrolae ("*pynolae*") Pers.; Gmel. Syst. Nat. **2**: 1473. 1791.
Uredo polymorpha Pyrolae Strauss, Ann. Wett. Ges. **2**: 87. 1810.
Uredo Pirolae H. Mart. Fl. Mosq. 229. 1812.
Hypodermium (*Uredo*) *Pyrolae* Link, Ges. Nat. Freunde Berlin Mag. **7**: 28. 1815.
Caeoma Pyrolae Schlecht. Fl. Berol. **2**: 122. 1824.
Trichobasis Pyrolae Berk. Outl. Brit. Fungi 332. 1860.
Physonema Pyrolae Niessl, Verh. Nat. Ver. Brünn **3**: 104. 1864.
Thecopsora Pyrolae Karst. Bidr. Finl. Nat. Folk **31**: 59. 1879.
Melampsora Pirolae Schröt. Krypt. Fl. Schles. 3^{1}: 366. 1887.
Uredo Chimaphilae Peck, Ann. Rep. N. Y. State Mus. **46**: 33. 1893.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous or amphigenous, small, more or less grouped, mammillose, yellowish-red, dehiscent by a central pore; peridium hemispherical, firm, cells large, elongated vertically, walls thin, 2 μ, gradually thickened below toward the orifice, ostiolar cells larger, 35–45 μ, greatly thickened below, coarsely echinulate above; urediniospores clavate-oblong or ellipsoid, 13–18 by 26–39 μ; wall colorless, medium thick, 1.5–2 μ, minutely echinulate; contents orange-red when fresh.

III. Telia hypophyllous adjoining uredinia, inconspicuous, flat, subepidermal, an even layer of laterally united cells; teliospores oblong or columnar, 10–12 by 24–28 μ; wall uniformly thin, 1 μ, colorless.

ON PYROLACEAE:
Chimaphila maculata (L.) Pursh, New Jersey, New York.
Chimaphila umbellata (L.) Nutt., Oregon, Wisconsin.
Pyrola chlorantha Sw., Wyoming.
Pyrola elliptica Nutt., New Hampshire, Pennsylvania, Wisconsin; Ontario.
Pyrola grandiflora Radius, Greenland.
Pyrola picta Smith, California.
Pyrola rotundifolia L., Montana.
Pyrola secunda L., California, Colorado, Oregon, Washington, Wisconsin; Ontario.
TYPE LOCALITY: Europe, on [*Pyrola* sp.].
DISTRIBUTION: New Jersey to Wisconsin, northern California and northward; also in Europe.
EXSICCATI: Sydow, Ured. *1791*, *1795*.

7. **Pucciniastrum sparsum** (Wint.) Ed. Fisch. Beitr. Krypt. Schweiz 2^{2}: 469. 1904.

Melampsora sparsa Wint. in Rab. Krypt. Fl. 1^{1}: 245. 1881.
Uredo Arbuti Dietel & Holway, Bot. Gaz. **18**: 256. 1893.
Pucciniastrum Arbuti Dietel & Holway; Dietel, E. & P. Nat. Pfl. 1^{1**}: 47. 1897.
Uredo Copelandi Sydow, Ann. Myc. **2**: 31. 1904.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous or only hypophyllous, gregarious on discolored spots, or scattered, bullate, round or irregular, 0.3–0.5 mm. across, dehiscent by central pore, long covered by overarching epidermis; peridium hemispherical, firm, cells large, elongate vertically, walls thin, 2 μ, gradually thickened below toward the orifice, smooth, ostiolar cells 35–50 μ high, greatly thickened below, coarsely to finely echinulate above; urediniospores clavate-oblong or ellipsoid, 12–20 by 26–45 μ; wall colorless, thin, 1–2 μ, finely and sparsely echinulate; contents orange-yellow when fresh.

III. Telia amphigenous, diffused, inconspicuous; teliospores in the epidermal cells, singly or in a layer, ellipsoid, 18–35 by 24–35 μ; wall cinnamon-brown, thin, 2 μ, much thicker above, 6 μ, with one apical pore.

ON ERICACEAE:
Arbutus densiflora H.B.K., Oaxaca.
? *Arbutus macrophylla* Mart., Morelos.
Arbutus Menziesii Pursh, California.

Arctostaphylos Manzanita Parry, California.
Arctostaphylos nevadensis A. Gray, California.
Arctostaphylos patula Greene, California.
Mairania alpina (L.) Desv. (*Arctostaphylos alpina* Spreng.), British Columbia, Quebec.
TYPE LOCALITY: St. Gall, Switzerland, at 2000 m., on *Arctostaphylos alpina*.
DISTRIBUTION: Canada from the Atlantic to the Pacific coast, southward in the mountains through California to southern Mexico; also in Europe.
ILLUSTRATION: Ed. Fisch. *loc. cit. f. 306.*
EXSICCATI: Rab.-Wint.-Paz. Fungi Eur. *4042*; Sydow, Ured. *1796, 1797.*

8. **Pucciniastrum minimum** (Schw.) Arth. Résult. Sci. Congr. Bot. Vienne 337. 1906.

Uredo minima Schw. Schr. Nat. Ges. Leipzig 1: 70. 1822.
Caeoma (*Uredo*) *Azaleae* Schw. Trans. Am. Phil. Soc. II. **4**: 291. 1832.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, minute, less than 0.3 mm. across, scattered or clustered on indefinite discolored spots, mammillose, pale-yellow, dehiscent by central pore, finally pulverulent, long covered by the overarching epidermis; peridium hemispherical, delicate, cells small, cuboidal, walls thin, 2 μ, ostiolar cells much larger, 14–16 μ high, wall thickened below, smooth; urediniospores ellipsoid, or obovate-oblong, 12–17 by 20–24 μ; wall colorless, thin, 1–1.5 μ, finely echinulate with sharp points.

III. Telia unknown.

ON ERICACEAE:
Azalea nudiflora L. (*Rhododendron nudiflorum* T. & G.), Alabama, New York, North Carolina, Pennsylvania, South Carolina.
Azalea viscosa L. (*Rhododendron viscosum* Torr.), Alabama, Massachusetts, New Jersey.
Menziesia pilosa (Michx.) Pers., West Virginia.
Rhodora canadensis L., New Hampshire.
TYPE LOCALITY: North Carolina, on *Azalea nudiflora*.
DISTRIBUTION: New York southward to South Carolina and Alabama.
EXSICCATI: Ellis, N. Am. Fungi *1081;* Rav. Fungi Am. *486.*

9. **Pucciniastrum Myrtilli** (Schum.) Arth. Résult. Sci. Congr. Bot. Vienne 337. 1906.

Aecidium ? Myrtilli Schum. Enum. Pl. Saell. **2**: 227. 1803.
Uredo pustulata γγ *Vaccinii* Alb. & Schw. Consp. Fung. 126. 1805.
Uredo Vacciniorum DC. Fl. Fr. **6**: 85. 1815.
Caeoma Vacciniorum Link, in Willd. Sp. Pl. 6^2: 15. 1825.
Thecopsora ? Vacciniorum Karst. Bidr. Finl. Nat. Folk **31**: 58. 1879.
Thecopsora myrtillina Karst. Bidr. Finl. Nat. Folk **31**: 59. 1879.
Melampsora Vaccinii Wint. in Rab. Krypt. Fl. 1^1: 224. 1881.
Melampsora Vacciniorum Schröt. Krypt. Fl. Schles. 3^1: 365. 1887.
Pucciniastrum Vacciniorum Dietel, in E. & P. Nat. Pfl. 1^1**: 47. 1897.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered or somewhat gregarious, small, 0.1–0.2 mm. across, bullate, round, dehiscent by small central pore, yellowish-red fading to pale-yellow, long covered by overarching epidermis; peridium hemispherical, firm, cells very small, cuboidal, wall uniformly thin, 1 μ, ostiolar cells large, ovoid, 25–35 μ high, walls smooth, uniformly thick, often nearly obliterating the lumen; urediniospores broadly obovate or ellipsoid, 13–19 by 16–24 μ; wall colorless, thin, 1–2 μ, minutely echinulate; contents orange-yellow when fresh.

III. Telia hypophyllous, minute, light-brown, indehiscent; teliospores within the epidermal cells, oblong or columnar, 7–10 by 14–17 μ; wall smooth, uniformly thin, 1 μ, nearly colorless.

ON VACCINIACEAE:
Gaylussacia resinosa (Ait.) T. & G., Massachusetts, New York.
Vaccinium caespitosum cuneifolium Nutt., Washington.
Vaccinium canadense Rich., Wisconsin.
Vaccinium corymbosum L., Alabama.
Vaccinium globulare Rydb., Idaho.
Vaccinium membranaceum Dougl. (*V. myrtilloides* Hook.), Idaho, Washington.
Vaccinium Myrsinites Lam., Florida.
Vaccinium oreophilum Rydb., Colorado.
Vaccinium uliginosum L., New Hampshire.
TYPE LOCALITY: Island of Zealand, Denmark, on *Vaccinium Myrtillus.*

DISTRIBUTION: New Hampshire to Washington, southward to Florida and Colorado; also in Europe.

EXSICCATI: Seym. & Earle, Econ. Fungi *44*, *486*; Sydow, Ured. *1188*.

5. **MELAMPSORIDIUM** Kleb. Zeits. Pflanzenkr. **9**: 21. 1899.

Cycle of development includes pycnia, aecia, uredinia, and telia, with distinct alternating phases; heteroecious. Pycnia subcuticular, other sori subepidermal.

Pycnia flattened-conoidal, without ostiolar filaments.

Aecia erumpent, subcylindrical. Peridium regularly dehiscent, cells rhomboidal. Aeciospores ellipsoid to globoid; wall colorless, thin, verrucose except one side which is thinner and smooth.

Uredinia somewhat erumpent. Peridium firm, dehiscent by central pore; peridial cells isodiametric, those of orifice prolonged into sharp points. Urediniospores borne singly on pedicels, ellipsoid; wall colorless, echinulate, pores indistinct.

Telia indehiscent, forming evident layers immediately beneath the epidermis. Teliospores oblong or prismatic, one-celled; wall smooth, slightly colored.

Type species, *Melampsora betulina* Tul. (on *Betula alba*).

1. **Melampsoridium Betulae** (Schum.) Arthur.

Uredo populina β *betulina* Pers. Syn. Fung. 219. 1801.
Uredo Betulae Schum. Enum. Pl. Saell. **2**: 228. 1803.
Uredo ovata Betulae Strauss, Ann. Wett. Ges. **2**: 93. 1810.
Melampsora betulina Tul. Ann. Sci. Nat. IV. **2**: 97. 1854.
Aecidium Laricis Kleb. Zeits. Pflanzenkr. **9**: 18. 1899.
Metampsoridium betulinum Kleb. Zeits. Pflanzenkr. **9**: 21. 1899.
Peridermium Laricis Arth. & Kern, Bull. Torrey Club **33**: 436. 1906.

O. Pycnia amphigenous, rather numerous, scattered, inconspicuous, subcuticular, pale-yellow, flattened conical, 50–65 μ in diameter by 20–30 μ high; pycniospores oval, 1.5–2 μ long, abundant.

I. Aecia from a limited mycelium, hypophyllous, solitary or in rows on one or both sides of the midrib, flattened laterally, or subcylindrical, 0.1–0.15 mm. wide, 0.3–1 mm. long, by 0.3–0.5 mm. high; peridium light reddish-orange fading to white, rupturing along the apical line, peridial cells rhomboidal in longitudinal section, 25–30 μ long, somewhat overlapping, inner wall finely verrucose, transversely striate, 2–3 μ thick, outer of equal thickness, smooth; aeciospores globoid or broadly ellipsoid, 12–18 by 16–25 μ; wall colorless, rather thin, 1–1.5 μ, closely and evenly verrucose, except a small area on one side which is smooth and slightly thinner.

ON PINACEAE:
Larix sp. Not yet found in America.

II. Uredinia hypophyllous, scattered, small, round, less than 0.5 mm. across, reddish-yellow, at last somewhat pulverulent; peridium hemispherical, firm, dehiscent by a small central orifice, cells polygonal, with outer wall thin, 1–3 μ, inner wall thick, 6–8 μ, extended at the orifice into long points; urediniospores elongate-elliptical or obovate, sometimes clavate, 8–14 by 22–38 μ; wall colorless, thin, less than 1 μ thick, strongly and sparsely echinulate, except apex, which is smooth; paraphyses rudimentary, thin-walled, fusiform, 7–11 by 25–35 μ.

III. Telia hypophyllous, scattered, small, scarcely 0.5 mm. across, often thickly covering the surface of the leaf, at first waxy-yellow, becoming brown and finally blackish, indehiscent; teliospores prismatic in a palisade-like layer beneath the epidermis, 7–16 by 30–50 μ, somewhat rounded at each end; wall nearly colorless, thin, scarcely 1 μ thick, slightly thicker at apex, 1.5 μ, smooth.

ON BETULACEAE:
Betula glandulosa Michx., Washington.
Betula lutea Michx., Indiana, New Hampshire.
Betula populifolia Marsh., Massachusetts.
Betula pumila L., Massachusetts, Michigan; Newfoundland.

TYPE LOCALITY: Island of Zealand, Denmark, on *Betula alba*.

DISTRIBUTION: Massachusetts, Indiana and Washington northward into Canada: also in Europe and Asia.

ILLUSTRATIONS: Kleb. *loc. cit. f. 1;* Beitr. Krypt. Schweiz **2**[2]: *f. 320.*
EXSICCATI: Ellis & Ev. N. Am. Fungi *2724;* Seym. & Earle, Econ. Fungi *212, 213;* Ellis & Ev. Fungi Columb. *1374.*

6. **MELAMPSORELLA** Schröt. Hedwigia **13**: 85. 1874.

Cycle of development includes pycnia, aecia, uredinia and telia, with distinct alternating phases; heteroecious. Pycnia subcuticular, aecia and uredinia subepidermal, telia in epidermal cells.

Pycnia hemispherical, without ostiolar filaments.

Aecia erumpent, definite, oblong, bullate. Peridium colorless, with thin-walled cells. Aeciospores ellipsoid; wall colorless, thin, verrucose, without smooth spot.

Uredinia barely protruding through the epidermis, dehiscent by a central pore. Peridium hemispherical, delicate, cells slightly or not enlarged at orifice. Urediniospores borne singly on pedicels, obovate to ellipsoid; wall slightly colored, echinulate, pores obscure.

Telia effused, indehiscent. Teliospores globoid to ellipsoid, one-celled; wall smooth, colorless, thin.

Type species, *Melampsorella Caryophyllacearum* Schröt. (on *Stellaria media*).

1. **Melampsorella elatina** (Alb. & Schw.) Arthur.

Uredo pustulata β *Cerastii* Pers. Syn. Fung. 219. 1801.
Aecidium elatinum Alb. & Schw. Consp. Fung. 121. 1805.
Uredo Cerastii H. Mart. Fl. Mosq. 231. 1812.
Hypodermium (*Uredo*) *Stellariarum* Link, Ges. Nat. Freunde Berlin Mag. **7**: 28. 1815.
Uredo pustulata β *Cerastiorum* DC. Fl. Fr. **6**: 85. 1815.
Peridermium elatinum Schmidt & Kunze, Deuts. Schwämme 6: 4. *141.* 1817.
Caeoma Cerastii Schlecht. Fl. Berol. **2**: 121. 1824.
Caeoma Caryophyllacearum Link, in Willd. Sp. Pl. **6**[2]: 26. 1825.
Melampsorella Caryophyllacearum Schröt. Hedwigia **13**: 85. 1874.
Melampsora Cerastii Wint. in Rab. Krypt. Fl. **1**[1]: 242. 1881.
Melampsorella Cerastii Schröt. Krypt. Fl. Schles. **3**[1]: 366. 1887.
Exobasidium Stellariae Sydow, Hedwigia Beibl. **38**: 134. 1899.

O. Pycnia epiphyllous, few, scattered, punctiform, inconspicuous, subcuticular, not extending much into walls of epidermis, depressed-hemispherical, small, 100–130 μ broad, 40–50 μ high.

I. Aecia from a perennial mycelium, dwarfing the young shoots, and forming witches' brooms; hypophyllous, forming two irregular lines, deep-seated, wholly dropping out of the substratum at maturity, roundish or irregularly oblong, large, 0.5–1 mm. across, bladdery, soon open by falling away of the upper part; peridium colorless, dehiscence irregular, cells with thin inner and outer walls; aeciospores broadly ellipsoid, or nearly globoid, 14–18 by 16–28 μ; wall colorless, thin, 1–1.5 μ, closely and rather finely verrucose.

ON PINACEAE:
Abies balsamea (L.) Mill., Maine, Massachusetts, Michigan, New Hampshire, New York, Vermont, Wisconsin; Prince Edward Island; Labrador; Newfoundland.
Abies lasiocarpa Nutt. (*A. subalpina* Engelm.), Montana, Utah, Wyoming.
Abies religiosa Lindl., Veracruz.

II. Uredinia amphigenous, scattered or somewhat grouped, small, round, 0.1–0.4 mm. across, orange-red when fresh, pale-yellow when dry; peridium hemispherical, dehiscent by a small central orifice, cells elongate at sides, polygonal above, inner and outer walls same thickness; urediniospores ellipsoid or obovoid, 12–18 by 16–30 μ; walls pale-yellow, rather thin, 1–1.5 μ, sparsely echinulate with short conical points.

III. Telia hypophyllous, on whitish or pale reddish spots; teliospores within the epidermal cells, 1-celled, short-cylindrical or polygonal, 13–20 μ broad; wall colorless, smooth, thin.

ON CARYOPHYLLACEAE:
Alsine baicalensis Cov. (*Stellaria umbellata* Turcz.), Wyoming.
Alsine brachypetala (Bong.) Howell, Washington.
Cerastium campestre Greene, Colorado, Montana, South Dakota.
Cerastium occidentale Greene, Montana.
Cerastium oreophilum Greene, Colorado.
Cerastium vulgatum L., Nebraska.
TYPE LOCALITY: Upper Lusatia, Germany, on *Pinus Picea* (*Abies alba*).

DISTRIBUTION: Massachusetts to Nebraska, Utah and northward; Mexico; also in Europe.
ILLUSTRATIONS: Ber. Deuts. Bot. Ges. **17**: *pl. 26*; Beitr. Krypt. Schweiz **2²**: *f. 322–326*.
EXSICCATI: Ellis, N. Am. Fungi *1437*; Ellis & Ev. Fungi Columb. *1629, 2232*.

7. **HYALOPSORA** Magn. Ber. Deuts. Bot. Ges. **19**: 582. 1901.

Cycle of development imperfectly understood; telia and two other spore-forms known, for convenience called aecia and uredinia. No evident alternating phases observed. Aecia and uredinia subepidermal, telia within epidermal cells.

Aecia barely protruding through the epidermis, irregularly dehiscent, roundish, bullate, without peridium. Aeciospores borne singly on pedicels, broadly obovate; wall colorless, minutely verrucose, pores obscure.

Uredinia similar to the aecia, but with depressed globoid peridium. Peridium delicate, with polygonal cells above and elongate cells at sides, the lateral cells usually reinforced with shorter cells outside. Urediniospores borne singly on pedicels, resembling the aeciospores, but usually smaller and thinner-walled, minutely verrucose, pores indistinct, equatorial.

Telia effused, indehiscent. Teliospores globoid, about four-celled by vertical intersecting septa; wall colorless, smooth, thin.

Type species, *Uredo Aspidiotus* Peck (on *Phegopteris Dryopteris*).

Urediniospores quite regularly obovate to globoid; aecia usually present.
- Spores large, wall rather thick. — 1. *H. Aspidiotus.*
- Spores small, wall thin. — 2. *H. Polypodii.*

Urediniospores irregularly elongate-obovate to globoid; aecia usually absent.
- Spore-wall appearing smooth. — 3. *H. laeviuscula.*
- Spore-wall clearly verrucose. — 4. *H. Cheilanthis.*

1. **Hyalopsora Aspidiotus** (Peck) Magn. Ber. Deuts. Bot. Ges. **19**: 582. 1901.

Uredo Polypodii β *Polypodii-dryopteridis* Moug. & Nestl.; DC. Fl. Fr. **6**: 81. 1815.
Uredo Aspidiotus Peck, Ann. Rep. N. Y. State Mus. **24**: 88. 1872.
Pucciniastrum Aspidiotus Karst. Bidr. Finl. Nat. Folk **31**: 143. 1879.
Caeoma Aspidiotus Peck, Bull. Torrey Club **10**: 62. 1883.
Melampsorella Aspidiotus Magn. Ber. Deuts. Bot. Ges. **13**: 288. 1895.
Hyalopsora Polypodii-dryopteridis Magn. Hedwigia Beibl. **41**: 224. 1902.

I. Aecia amphigenous, rounded, small, 0.2–0.5 mm. across, bullate, yellow, tardily dehiscent; aeciospores ellipsoid or polyhedral, large, 30–40 by 40–55 μ, wall thick, 2.5–3.5 μ, colorless, indistinctly verrucose, appearing smooth when wet, pores 6–8, scattered.

II. Uredinia amphigenous, irregularly scattered, round, small, 0.2–0.5 mm. across, golden-yellow, soon dehiscent by rupture above, somewhat pulverulent; peridium rudimentary, delicate, urediniospores ellipsoid or oval, 19–24 by 29–35 μ; wall colorless, medium thick, 1.5–2 μ, minutely verrucose, pores 4, equatorial.

III. Teliospores in epidermal cells, globoid, often irregular, 25 by 21–35 μ, usually 4-celled, but frequently 3- or 5-celled; wall thin, 1 μ, colorless, smooth.

ON POLYPODIACEAE:
Phegopteris Dryopteris (L.) Fée (*Polypodium Dryopteris* L.), Michigan, Montana, New Hampshire, New York; Alaska; British Columbia.
TYPE LOCALITY: Catskill mountains, New York, on *Phegopteris Dryopteris*.
DISTRIBUTION: New Hampshire to British Columbia, and northward; also in Europe.
ILLUSTRATIONS: Ber. Deuts. Bot. Ges. **13**: *pl. 23*; Beitr. Krypt. Schweiz **2²**: *f. 308*.
EXSICCATI: Thüm. Myc. Univ. *950*; Sydow, Ured. *1899*.

2. **Hyalopsora Polypodii** (DC.) Magn. Ber. Deuts. Bot. Ges. **19**: 582. 1901.

Uredo linearis β *Polypodii* Pers. Syn. Fung. 217. 1801.
Uredo Polypodii DC. Fl. Fr. **6**: 81. 1815.
Uredo Aspidii Poll. Giorn. Fis. **9**: 182. 1816.
Caeoma Filicum Link, in Willd. Sp. Pl. **6²**: 36. 1825.

I. Aecia hypophyllous, similar to the uredinia; aeciospores globoid or obovate-globoid, somewhat angular, 18–25 by 27–33 μ; wall nearly or quite colorless, medium thick, 2–3 μ, minutely verrucose, appearing smooth when wet, pores 6–8, scattered.

II. Uredinia hypophyllous, scattered, bullate, irregularly rounded or oblong, rather small, 0.2–0.4 mm. across, tardily dehiscent by irregular rupture, golden-yellow, somewhat pulverulent; peridium rudimentary, delicate; urediniospores globoid or elliptical-globoid, 14–20 by 19–30 μ; wall colorless, thin, 1–1.5 μ, minutely verrucose, appearing smooth when wet, pores 4, equatorial.

III. Telia hypophyllous on yellow spots; teliospores in epidermal cells, 2–4-celled, globoid, 14–18 μ in diameter; wall thin, colorless, with apical pore.

ON POLYPODIACEAE:
Filix bulbifera (L.) Underw. (*Cystopteris bulbifera* Bernh.), Wisconsin.
Filix fragilis (L.) Underw. (*Polypodium fragilis* L., *Cystopteris fragilis* Bernh.), Colorado, Delaware, Illinois, Indiana, Massachusetts, Montana, New York, Utah, Washington, Wisconsin, Wyoming.
Woodsia glabella R. Br., Michigan.
TYPE LOCALITY: Europe, on *Polypodium fragilis*.
DISTRIBUTION: Delaware to Illinois, Colorado, and northward; also in Europe.
ILLUSTRATION: Beitr. Krypt. Schweiz **2**[2]: *f. 309*.
EXSICCATI: Ellis & Ev. N. Am. Fungi *2437*; Ellis & Ev. Fungi Columb. *559, 765*; Sydow, Ured. *1948*.

3. **Hyalopsora laeviuscula** (Dietel & Holway) Arthur.

Uredo laeviuscula Dietel & Holway, Erythea **2**: 127. 1894.
Thecopsora laeviuscula Dietel, Ann. Myc. **1**: 416. 1903.

I. Aecia unknown.

II. Uredinia hypophyllous, scattered, roundish, 0.3–0.5 mm. across, bullate, tardily dehiscent by rupture; peridium delicate; urediniospores very irregular, oblong, obovate, even linear, 15–22 by 25–40 μ; wall colorless, thin, 1–1.5 μ, minutely verrucose, appearing smooth when wet, pores obscure.

III. Teliospores more or less crowded in the epidermal cells, 4-celled, globoid, 15–20 μ broad; wall colorless, smooth, thin, 1–1.5 μ.

ON POLYPODIACEAE:
Polypodium californicum Kaulf., California.
Polypodium Glycyrrhiza D. C. Eaton (*P. falcatum* Kell.), Washington.
TYPE LOCALITY: Mt. Tamalpais, California, on *Polypodium californicum*.
DISTRIBUTION: Central California and northward along the coast.

4. **Hyalopsora Cheilanthis** (Peck) Arthur.

Caeoma Cheilanthis Peck, Bull. Torrey Club **10**: 62. 1883.
Uredo Pellaeae Dietel & Neger, Bot. Jahrb. **27**: 15. 1899.
Uredo Pasadenae Sydow, Ann. Myc. **2**: 31. 1904.
Hyalopsora pellaeicola Arth. Bull. Torrey Club **33**: 30. 1906.

I. Aecia unknown.

II. Uredinia amphigenous, scattered, irregularly round or oblong, bullate, 0.3–0.7 mm. across, dehiscent by apical rupture, soon naked, pulverulent, golden-yellow, ruptured epidermis noticeable; peridium very delicate and difficult to detect, walls thin; urediniospores globoid or obovate-globoid, 16–22 by 20–30 μ; wall colorless, thin, 1 μ, often seemingly much thicker, minutely verrucose, or even echinulate-verrucose, pores obscure, equatorial.

III. Telia unknown.

ON POLYPODIACEAE;
Ceropteris triangularis (Kaulf.) Underw. (*Gymnogramme triangularis* Kaulf.), California.
Cheilanthes Pringlei Dav., Arizona.
Cryptogramme Stelleri (Gmel.) Prantl (*Pellaea gracilis* Hook.), Iowa, Michigan.
Pellaea andromedaefolia (Kaulf.) Fée, California.
TYPE LOCALITY: Southeastern Arizona, on *Cheilanthes Pringlei*.
DISTRIBUTION: Lake Superior to California; also in South America.

8. **CALYPTOSPORA** Kühn, Hedwigia **8**: 81. 1869.

Cycle of development includes pycnia, aecia and telia, with distinct alternating phases; heteroecious. Pycnia subcuticular, aecia arising within the mesophyl, telia in the epidermal cells.

Pycnia rarely seen, but probably much flattened, low, without ostiolar filaments.

Aecia erumpent, cylindrical, dehiscent at apex. Peridium colorless, with thin-walled cells. Aeciospores ellipsoid; wall colorless, thin, verrucose without smooth spot.

Telia forming continuous layers of considerable extent, indehiscent. Teliospores oblong to ellipsoid, about 4-celled by vertical, intersecting septa; wall smooth, colored, thin, with apical thickening.

Type species, *Calyptospora Goeppertiana* Kühn (on *Vaccinium Vitis-Idaea*).

1. **Calyptospora columnaris** (Alb. & Schw.) Kühn; Rab.-Wint. Fungi Eur. *3521.* 1886. (Hedwigia **26**: 28. 1887.)

Aecidium columnare Alb. & Schw. Consp. Fung. 121. *pl. 5, f. 4.* 1805.
Peridermium columnare Schmidt & Kunze, Deuts. Schwämme 6: 4. *140.* 1817.
Caeoma columnare Link, in Willd. Sp. Pl. 6^2: 66. 1825.
Calyptospora Goeppertiana Kühn, Hedwigia **8**: 81. 1869.
Melampsora Goeppertiana Wint. in Rab. Krypt. Fl. 1^1: 245. 1881.
Pucciniastrum Goeppertianum Kleb. Wirtsw. Rostp. 391. 1904.

O. Pycnia uncertain.

I. Aecia hypophyllous, from a limited mycelium, not changing form of leaf, in two irregular rows on yellowish spots occupying a part or all of a leaf, cylindrical, 0.5–1 mm. long, dehiscent at apex; peridium colorless, margin rather finely lacerate, cells overlapping, both outer and inner walls thin, finely verrucose on inner face; aeciospores broadly ellipsoid, small, 14–18 by 19–24 μ; wall colorless, thin, 1–1.5 μ, finely and rather closely verrucose; contents orange-red fading to pale-yellow.

ON PINACEAE:
Abies alba Mill. and other species, Europe; not recorded for America.

III. Telia caulicolous, from a perennial mycelium, forming a continuous layer around the abnormally elongated and thickened stems, surface even, polished, reddish-brown, becoming dull; teliospores in the epidermal cells, closely pressed, prismatic, usually 4-celled, oblong or ellipsoid, 10–14 by 18–30 μ; wall golden-brown, smooth, thin, 0.5–0.8 μ, slightly thicker at apex, 1–1.5 μ.

ON VACCINIACEAE:
Vaccinium canadense Rich., Massachusetts.
Vaccinium Chandleri Jeps., California.
Vaccinium corymbosum L., Massachusetts.
Vaccinium membranaceum Dougl., Idaho, Washington.
Vaccinium oreophilum Rydb. (*V. Myrtillus* A. Gray), Colorado; Alberta.
Vaccinium ovalum Pursh, California, Washington.
Vaccinium parvifolium J. E. Smith, Washington.
Vaccinium pennsylvanicum Lam., Maine, Massachusetts; Newfoundland.
Vitis-Idaea Vitis-Idaea (L.) Britton (*Vaccinium Vitis-Idaea* L.), New Hampshire.
TYPE LOCALITY: Upper Lusatia, Germany, on *Abies alba*.
DISTRIBUTION: Massachusetts to northern California and northward; also in Europe.
ILLUSTRATIONS: E. & P. Nat. Pfl. 1^{1**}: *f. 29 a–c;* Beitr. Krypt. Schweiz 2^2: *f. 304.*
EXSICCATI: Sydow, Ured. *1743, 1792;* Ellis, N. Am. Fungi *1073;* Ellis & Ev. Fungi Columb. *555.*

9. **NECIUM** Arthur, gen. nov.

Cycle of development includes telia, which fill epidermal cells, and possibly pycnia.

Telia indehiscent, forming continuous layers, more or less distinguishable as compound sori. Teliospores oblong or prismatic, apparently one-celled; wall smooth, slightly colored.

Type species, *Necium Farlowii* Arthur (on *Tsuga canadensis*).

1. **Necium Farlowii** Arthur, sp. nov.

O. Pycnia unknown, probably not formed.

III. Telia hypophyllous, on either side of the midrib, forming somewhat raised, compound sori, reddish, waxy, linear, 0.3–0.6 mm. broad by 1–2 mm. long, each single sorus about 60–100 μ broad; teliospores in the enlarged epidermal cells, closely appressed, oblong or cylindrical, 7–10 by 35–58 μ; wall very pale-brown, smooth, uniformly thin, 0.5–0.8 μ.

ON PINACEAE:
Tsuga canadensis (L.) Carr. (*Abies canadensis* Michx.), Massachusetts, New Hampshire.
Type collected at Chebacco Lake, Massachusetts, on *Abies canadensis*, June, 1883, *A. B. Seymour.*
DISTRIBUTION: New England states.

10. **UREDINOPSIS** Magn. Atti Congr. Bot. Genova 167. 1893.

Cycle of development imperfectly understood; telia and two other spore-forms known, for convenience called aecia and uredinia. No evident alternating phases observed. Aecia and uredinia subepidermal, teliospores solitary, scattered in the mesophyl, segregated beneath the epidermis, or rarely within the epidermal cells.

Aecia roundish, bullate, small, indehiscent. Peridium depressed-globoid, delicate, with polygonal cells above and elongate cells at sides, the lateral cells usually reinforced with shorter cells outside. Aeciospores borne singly on pedicels, but packed in sorus as if catenulate, obovate to globoid, angular, or polyhedral, rarely acute above; wall colorless, medium thick, thicker along the angles, minutely verrucose.

Uredinia bullate, roundish, usually larger than the aecia, dehiscent by central rupture, from which the agglutinated spores are ejected in a long, white filament. Peridium more delicate than in aecia, and often imperfect. Urediniospores borne singly on pedicels, fusiform, acute or beaked above, narrowed below; wall colorless, thin, smooth, except two opposite, longitudinal, thickened ridges bearing single rows of minute projections, often invisible when wet.

Teliospores globoid, one- to four-celled or more, usually with intersecting septa; wall smooth, colorless, thin.

Type species, *Uredinopsis filicina* Magn. (on *Phegopteris vulgaris*).

Urediniospores echinulate on the two longitudinal ridges.
- Echinulations long, cilia-like; beak very long. — 1. *U. Osmundae.*
- Echinulations short, minute points; beak medium long. — 2. *U. mirabilis.*

Urediniospores verrucose on the two longitudinal ridges.
- Sculpturing distinct, when seen dry.
  - Papillae coarse, loosely set, often a few on face of spore; beak very short. — 3. *U. Pteridis.*
  - Papillae fine, closely set; beak usually short. — 4. *U. Copelandi.*
- Sculpturing obscure, even when dry.
  - Papillae appearing as serrations; beak medium short, strong. — 5. *U. Struthiopteridis.*
  - Papillae fine, closely set; beak very long, slender. — 6. *U. Phegopteridis.*
  - Papillae very obscure; beak long, strong. — 7. *U. Atkinsonii.*

1. **Uredinopsis Osmundae** Magn. Hedwigia **43**: 123. 1904.

Milesia Osmundae Arth. Résult. Sci. Congr. Bot. Vienne 337. 1906.

I. Aecia unknown.

II. Uredinia hypophyllous on yellow spots, roundish, 0.2–0.4 mm. across, bullate, widely dehiscent by central rupture, spores exuded in a white filiform mass; urediniospores oval or fusiform, 13–18 by 36–57 μ, acute or acuminate above with apex prolonged into a moderately strong, uniform beak, 8–20 μ long, often bent; wall colorless, thin, 1 μ, smooth except the two opposite longitudinal lines of delicate crowded cilia, 2–3 μ long.

III. Teliospores segregated in and beneath the epidermal cells of both surfaces of the leaf, numerous, globoid or ellipsoid, 20–33 μ broad by 18–22 μ high, usually 4-celled, sometimes 2-many-celled; wall colorless, thin, 1–1.5 μ, smooth.

ON OSMUNDACEAE:
Osmunda cinnamomea L., Alabama, Maine, Massachusetts, New York, Wisconsin.
Osmunda Claytoniana L., Maine, New Hampshire, New York.
Osmunda spectabilis Willd. (*O. regalis* L., in pt.), Wisconsin.
TYPE LOCALITY: Cayuga Lake, New York, on *O. cinnamomea*.
DISTRIBUTION: Alabama to Wisconsin and northeastward to Maine.
ILLUSTRATION: Hedwigia **43**: *pl. 2, f. 8–16.*

2. **Uredinopsis mirabilis** (Peck) Magn. Hedwigia **43**: 121. 1904.

Septoria mirabilis Peck, Ann. Rep. N. Y. State Mus. **25**: 87. 1873.
Uredinopsis americana Sydow, Ann. Myc. **1**: 325. 1903.
Milesia mirabilis Arth. Résult. Sci. Congr. Bot. Vienne 337. 1906.

I. Aecia hypophyllous, scattered, or somewhat gregarious, roundish, small, 0.1–0.2 mm. across; peridium strongly developed; aeciospores angularly obovate or polyhedral, 15–20 by 24–36 μ; wall colorless, medium thick, 2–3 μ, thicker at the angles, minutely verrucose.

II. Uredinia hypophyllous, scattered on discolored areas, roundish, small, 0.1–0.2 mm. across, soon dehiscent by apical rupture; peridia as in aecia, but more delicate; urediniospores fusiform or ovate-fusiform, 12–17 by 35–50 μ, acuminate above, with apex prolonged into a tapering, pointed beak, 3–12 μ long; wall colorless, thin, 1 μ or less, smooth except the two distinctly echinulated lines of closely set, minute points.

III. Teliospores scattered in the mesophyl of the leaf, globose, or somewhat broader than high, 25–29 μ broad by 20–23 μ high, 2–4-celled; wall colorless, thin, 1 μ, smooth.

ON POLYPODIACEAE:
Lorinseria areolata (L.) Presl (*Woodwardia areolata* Moore), New Jersey, New York.
Onoclea sensibilis L., Connecticut, Illinois, Maine, Maryland, Massachusetts, New York, Pennsylvania, Wisconsin.
TYPE LOCALITY: Sandlake, New York, on *Onoclea sensibilis*.
DISTRIBUTION: Maryland to Wisconsin and northward into Canada; also in Europe.
ILLUSTRATION: Hedwigia **43**: *pl. 1.*
EXSICCATI: Rav. Fungi Car. **4**: *97;* Seym. & Earle, Econ. Fungi *B 8;* Ellis & Ev. Fungi Columb. *1987.*

3. **Uredinopsis Pteridis** Dietel & Holway, Ber. Deuts. Bot. Ges. **13**: 331. 1895.

Uredo Pteridis Dietel & Holway, Erythea **2**: 127. 1894.
Milesia Pteridis Arth. Résult. Sci. Congr. Bot. Vienne 337. 1906.

I. Aecia unknown.

II. Uredinia hypophyllous, roundish, large, 0.3–1 mm. across, bullate, light-yellow, tardily dehiscent by central rupture; peridium delicate; urediniospores oval or fusiform, 11–18 by 30–58 μ, apex acute, rarely tipped with a short, stout beak, 3–7 μ long; wall thin, 1–1.5 μ, colorless, smooth, or with a few scattered papillae, beside the two sharply defined longitudinal rows of loosely set papillae.

III. Teliospores scattered in the mesophyl of the leaf, delicate, globoid, 1–4-celled, small, 19–27 μ broad by 19–23 μ high; wall colorless, very thin, 0.75–1 μ, smooth.

ON POLYPODIACEAE:
Pteridium aquilinum pubescens Underw., California, Washington.
Pteridium caudatum (L.) Maxon, Florida.
TYPE LOCALITY: Pasadena, California, on "*Pteris aquilina.*"
DISTRIBUTION: Pacific coast of the United States; Florida.
ILLUSTRATION: Ber. Deuts. Bot. Ges. **13**: *pl. 26, f. 10–11.*

4. **Uredinopsis Copelandi** Sydow, Ann. Myc. **2**: 30. 1904.

Milesia Copelandi Arth. Résult. Sci. Congr. Bot. Vienne 337. 1906.

I. Aecia hypophyllous, hemispherical, minute, brown; peridium delicate; aeciospores polyhedral, 13–24 by 19–29 μ; wall colorless, medium thick, 2–3 μ, thicker at the angles, finely verrucose.

II. Uredinia hypophyllous, scattered, minute, pale-brown; peridium opening by central rupture; urediniospores fusiform, 14–18 by 31–40 μ, bluntly acute at apex or tipped with a short, stout beak, 3–7 μ long; wall thin, 1 μ, colorless, smooth, except the two longitudinal lines of fine, closely set papillae.

III. Teliospores imbedded in the mesophyl, 2–4-celled.

ON POLYPODIACEAE:
Athyrium cyclosorum Rupr., California.
TYPE LOCALITY: Sisson, California, on *Athyrium cyclosorum.*
DISTRIBUTION: Northern California.
EXSICCATI: Sydow, Ured. *1790.*

5. **Uredinopsis Struthiopteridis** Störmer, Bot. Notiser **1895**: 81. 1895.

I. Aecia hypophyllous, scattered, roundish, bullate, 0.1–0.3 mm. across, pale yellow; peridium strongly developed; aeciospores oblong or obovate, 15–18 by 28–39 μ; wall colorless, thick, 2.5–3.5 μ, much thicker at the angles, minutely verrucose, appearing smooth when wet.

II. Uredinia hypophyllous, scattered on discolored areas, roundish, 0.1–0.3 mm. across, pale yellow, dehiscent by apical rupture; peridium as in aecia, but more delicate; uredinio-

spores fusiform or lanceolate, 12–16 by 35–45 μ, acute or acuminate, with the apex prolonged into a strong, tapering beak, 3–10 μ long; wall colorless, thin, 1 μ, smooth, except the two longitudinal ridges, which appear finely serrated.

III. Teliospores scattered in the mesophyl, globose, or somewhat broader than high, 16–24 μ broad by 14–22 μ high, 2–4-celled; wall colorless, thin, 1 μ, smooth.

ON POLYPODIACEAE:
Anchistea virginica (L.) Presl (*Woodwardia virginica* J. E. Smith), Vermont.
Matteuccia Struthiopteris (L.) Tod. (*Struthiopteris germanica* Willd., *Onoclea Struthiopteris* Hoffm.), Newfoundland.
TYPE LOCALITY: Marradalen near Copenhagen, Denmark, on *Struthiopteris germanica*.
DISTRIBUTION: Northern New England and northward; also in Europe.
ILLUSTRATION: Ber. Deuts. Bot. Ges. **13**: *pl. 26, f. 5–9, 12–13.*

6. **Uredinopsis Phegopteridis** Arthur, sp. nov.

I. Aecia unknown.

II. Uredinia hypophyllous, scattered on discolored areas bounded by the veins, roundish, bullate, very small, 0.1 mm. across or less, brownish-yellow, dehiscent by apical rupture; peridium delicate; urediniospores ovoid or fusiform, 10–16 by 29–58 μ, acute or acuminate, prolonged into a very long and slender, sharp-pointed beak, 12–26 μ long; wall colorless, thin, 1 μ, smooth except the two longitudinal lines of closely set, minute papillae, scarcely visible even when dry.

III. Teliospores numerous in the mesophyl, 2–4-celled, globoid, 15–19 μ in diameter; wall colorless, thin, 1 μ or less, smooth.

ON POLYPODIACEAE:
Phegopteris Dryopteris (L.) Fée, Wisconsin.
Type collected in Vilas County, Wisconsin, July 28, 1902, *J. J. Davis*.

7. **Uredinopsis Atkinsonii** Magn. Hedwigia **43**: 123. 1904.

Milesia Atkinsonii Arth. Résult. Sci. Congr. Bot. Vienne 337. 1906.

I. Aecia hypophyllous, on pale spots, small, 0.1–0.3 mm. across; peridium strongly developed; aeciospores oval or obovate, angular, 12–20 by 25–43 μ, sometimes acute with a short mucro; wall colorless, rather thick, 1.5–2.5 μ, closely and minutely rugose, appearing smooth when wet.

II. Uredinia hypophyllous, on discolored areas, roundish, very small, 0.1–0.15 mm. across, pale yellow, dehiscent by central rupture; peridium delicate; urediniospores ovoid or fusiform, 10–15 by 35–50 μ, acute or acuminate, with the apex prolonged into a uniform beak, 5–15 μ long; wall colorless, thin, 1 μ, smooth except the two longitudinal lines of obscurely defined, minute papillae, scarcely visible even when dry.

III. Teliospores scattered in the mesophyl of the leaf, globoid, 13–20 by 16–29 μ, 2–4-celled; wall thin, 1 μ, smooth, colorless.

ON POLYPODIACEAE:
Asplenium Filix-foemina (L.) Bernh., Massachusetts.
Dryopteris Thelypteris (L.) A. Gray (*Aspidium Thelypteris* Sw.), Delaware, Massachusetts, Michigan, New York, Wisconsin.
TYPE LOCALITY: Cayuga Lake near Ithaca, New York, on *Aspidium Thelypteris*.
DISTRIBUTION: Delaware to Wisconsin and northward.
ILLUSTRATION: Hedwigia **43**: *pl. 2, f. 1–7.*
EXSICCATI: Seym. & Earle, Econ. Fungi *B 7.*

11. **MELAMPSOROPSIS** (Schröt.) Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Coleosporium § *Melampsoropsis* Schröt. Beitr. Biol. Pfl. **3**: 57. 1879.

Cycle of development includes pycnia, aecia, uredinia and telia, with distinct alternating phases; heteroecious. Pycnia and other sori subepidermal.

Pycnia deep-seated, somewhat erumpent, flask-shaped.

Aecia erumpent, flattened laterally. Peridium firm, outer wall of cells greatly thickened and transversely striate, inner wall smooth. Aeciospores ellipsoid to globoid; wall colorless, coarsely verrucose with deciduous tubercles.

Uredinia erumpent, pulverulent. Peridium very delicate, evanescent, sometimes wanting. Urediniospores catenulate, globoid to lanceolate; wall colorless, verrucose with somewhat deciduous tubercles, pores obscure.

Telia erumpent, definite, roundish, waxy becoming velvety. Teliospores catenulate, one-celled, oblong or cuboid; wall colorless, thin, smooth.

Type species, *Chrysomyxa Ledi* (Alb. & Schw.) DeBary (on *Ledum palustre*).

Telial host belonging to family Empetraceae.	1. *M. Empetri.*
Telial host belonging to family Pyrolaceae.	2. *M. Pyrolae.*
Telial host belonging to family Ericaceae.	
Uredinia and telia epiphyllous.	3. *M. ledicola.*
Uredinia and telia hypophyllous.	
Urediniospores ellipsoid.	
Telia inconspicuous, spores small.	4. *M. Cassandrae.*
Telia noticeable, spores medium.	5. *M. abietina.*
Telia large, spores large.	6. *M. Arctostaphyli.*
Urediniospores lanceolate.	7. *M. Piperiana.*
Telial host belonging to family Vacciniaceae.	8. *M. Chiogenis.*

1. **Melampsoropsis Empetri** (Pers.) Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Uredo Empetri Pers.; DC. Fl. Fr. **6**: 87. 1815.
Caeoma Empetri Link, in Willd. Sp. Pl. **6**^{2}: 16. 1825.
Erysibe Empetri Wallr. Fl. Crypt. Germ. **2**: 199. 1833.
Thecopsora Empetri Karst. Bidr. Finl. Nat. Folk **31**: 143. 1879.
Chrysomyxa Empetri Schröt. Krypt. Fl. Schles. **3**^{1}: 372. 1887.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, round or oblong, at first covered by the bladdery epidermis, finally naked and pulverulent, orange-red, ruptured epidermis conspicuous; peridium delicate or wanting; urediniospores elliptical or ovoid, 18–26 by 26–37 μ; wall colorless, medium thick, 2–3 μ, verrucose, with short, deciduous, slightly separated tubercles, pores obscure; contents orange-colored when fresh.

III. Telia unknown.

ON EMPETRACEAE:
Empetrum nigrum L., New Hampshire, New York; Quebec.
TYPE LOCALITY: Vosges, France, on *Empetrum nigrum*.
DISTRIBUTION: New England and New York northward; also in Europe.

2. **Melampsoropsis Pyrolae** (DC.) Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Aecidium (?) *Pirolae* DC. Fl. Fr. **6**: 99. 1815.
Caeoma (*Aecidium*) *pyrolatum* Schw. Trans. Am. Phil. Soc. II. **4**: 294. 1832.
Uredo pirolatum Körn. Hedwigia **16**: 28. 1877.
Chrysomyxa pirolatum Wint. in Rab. Krypt. Fl. **1**^{1}: 250. 1881.
Chrysomyxa Pirolae Rostr. Bot. Centr. **3**: 126. 1881.

O. and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, small, 1 mm. in diameter, round, evenly distributed, yellowish-red, pulverulent, ruptured epidermis evident; peridium delicate, walls smooth, colorless, thin, 1 μ; urediniospores elliptical or obovate, often angular, 16–23 by 20–30 μ; wall colorless, medium thick, 1.5–2 μ, prominently verrucose with somewhat deciduous warts; contents orange-red.

III. Telia hypophyllous, evenly and closely scattered, small, round, 0.2–0.4 mm. across, flat, waxy, at first yellowish-red, afterward blood-red; teliospores irregularly ellipsoid, 7–9 by 12–19 μ, in a series 100–130 μ long; wall colorless, smooth, thin, 1 μ; basidiospores 7–8 μ in diameter.

ON PYROLACEAE:
Moneses uniflora (L.) A. Gray (*M. grandiflora* S. F. Gray), Colorado, Maine, Wyoming; Alaska; Quebec.
Pyrola asarifolia Michx., Colorado, Pennsylvania.
Pyrola chlorantha Sw., Colorado, New York, Wyoming.
Pyrola elliptica Nutt., Iowa, Maine, Minnesota, New Hampshire, New York, Ohio, Pennsylvania.
Pyrola grandiflora Radius, Greenland.
Pyrola minor L., Greenland.

Pyrola rotundifolia L., Maine, New Hampshire; Quebec.
Pyrola secunda L., Colorado, Michigan, Minnesota, Nevada, Utah, Wyoming; Alaska; Ontario, Prince Edward Island.
Pyrola uliginosa Torr., California, Connecticut, District of Columbia, Maryland, Massachusetts, Montana, New Hampshire, New Jersey, New York, Utah; Alaska.

TYPE LOCALITY: Jura, France, on *Pyrola secunda*.

DISTRIBUTION: Pennsylvania to Ohio and Nevada, northward, especially in the mountains, to Greenland and Alaska; also in Europe.

EXSICCATI: Ellis & Ev. N. Am. Fungi *1812*; Ellis & Ev. Fungi Columb. *1814*; Thüm. Myc. Univ. *752*; Clements, Crypt. Form. Colo. *149*.

3. **Melampsoropsis ledicola** (Peck) Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Uredo ledicola Peck, Ann. Rep. N. Y. State Mus. **25**: 90. 1873.
Puccinia Ledi B. & C. Grevillea **3**: 54. 1874.
Chrysomyxa ledicola Lagerh. Tromsø Mus. Aarsh. **16**: 119. 1893.
Dicaeoma Ledi Kuntze, Rev. Gen. **3**: 469. 1898.

O and I. Pycnia and aecia unknown.

II. Uredinia epiphyllous, somewhat circinate on reddish-brown spots, roundish or oblong-polygonal, 0.25–0.5 mm. across, early dehiscing, ruptured epidermis prominent; peridium delicate, about 15 μ thick, wall thin, 1 μ, colorless, smooth; urediniospores broadly elliptical or globoid, 18–29 by 26–36 μ; wall thick, 2.5–3 μ, colorless, verrucose with closely set, elongate and deciduous tubercles; contents orange-red.

III. Telia epiphyllous, scattered or grouped, flat, small, at first blood-red; teliospores oblong or cuboid, 10–14 by 13–18 μ, in a series 65–80 μ long; wall colorless, thin, 1 μ, smooth; contents orange-red when fresh.

ON ERICACEAE:
Ledum groenlandicum Oeder (*L. latifolium* Ait.), Maine, New Hampshire, New York, Washington; Alaska; Greenland; Alberta, British Columbia.
Ledum palustre L., Alaska; Labrador.

TYPE LOCALITY: Summit of Mt. Marcy, New York, on *Ledum latifolium*.

DISTRIBUTION: Boreal regions, southward in the mountains to Washington, New York, and New Hampshire.

EXSICCATI: Ellis & Ev. N. Am. Fungi *1883*; Rab.-Wint. Fungi Eur. *3632*.

4. **Melampsoropsis Cassandrae** (Peck & Clinton) Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Uredo Cassandrae Peck & Clinton; Peck, Ann. Rep. N. Y. State Mus. **30**: 54. 1879.
Caeoma Cassandrae Gobi, Scripta Bot. Hort. Univ. Petrop. **1**: 177. 1886.
Caeoma Cassandrae Rostr. Medd. Bot. For. Kjøb. **2**: 90. 1888.
Chrysomyxa Cassandrae Tranz. Trudi S. Peterb. Obshch. Est. Otd. Bot. **23**: 28. 1893.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, in small groups, somewhat angular, flat, 0.25–0.5 mm. across, ruptured epidermis evident; peridium inconspicuous, delicate; urediniospores catenulate, broadly elliptical, irregular, 15–18 by 19–32 μ; wall colorless, thin, 1–2 μ, closely verrucose with somewhat deciduous tubercles; contents orange.

III. Telia hypophyllous, very small, 130–160 μ across, pale-orange, very inconspicuous; teliospores oblong, 11–16 μ broad, in a series 60–70 μ long; wall uniformly thin, colorless, smooth; basidiospores globoid, colorless, about 4.5 μ in diameter.

ON ERICACEAE:
Chamaedaphne calyculata (L.) Moench (*Cassandra calyculata* D. Don), Maine, Michigan, New York, Wisconsin.
Pieris mariana (L.) Benth & Hook. (*Andromeda mariana* L.), Delaware.
Pieris nitida (Bartr.) Benth & Hook. (*Andromeda nitida* Bartr.), Georgia.
Xolisma ligustrina (L.) Britton (*Andromeda ligustrina* Muhl.), Alabama.

TYPE LOCALITY: Center, New York, on *Cassandra calyculata*.

DISTRIBUTION: Maine to Wisconsin, south to Georgia and Alabama; also in northern Europe.

EXSICCATI: Ellis & Ev. N. Am. Fungi *2717*, *3053*; Seym. & Earle, Econ. Fungi *486*; Ellis & Ev. Fungi Columb. *356*; Rav. Fungi Am. *731*.

5. **Melampsoropsis abietina** (Alb. & Schw.) Arthur.

Aecidium abietinum Alb. & Schw. Consp. Fung. 120. 1805.
Uredo Ledi Alb. & Schw. Consp. Fung. 125. 1805.
Caeoma Ledi Link, in Willd. Sp. Pl. 6^2: 15. 1825.
Caeoma piceatum Link, in Willd. Sp. Pl. 6^2: 62. 1825.

Uredo abietina Spreng. Syst. Veg. **4**: 572. 1827.
Erysibe Ledi Wallr. Fl. Crypt. Germ. **2**: 199. 1833.
Uredo ovoideo-aurantiaca Bon. Coniom. 32. 1860.
Chrysomyxa Ledi DeBary, Bot. Zeit. **37**: 809. 1879.
Pucciniastrum Ledi Karst. Bidr. Finl. Nat. Folk **31**: 57. 1879.
Coleosporium Ledi Schröt. Beitr. Biol. Pfl. **3**: 55. 1879.
Peridermium abietinum Thüm. Mitth. Forstl. Vers. Oest. **2**: 320. 1880.
Melampsoropsis Ledi Arth. Result. Sci. Congr. Bot. Vienne 338. 1906.

O. Pycnia amphigenous, numerous, irregularly scattered, orange-yellow, becoming chestnut-brown, punctiform, conspicuous, flask-shaped, erumpent, 100–130 μ across.

I. Aecia hypophyllous, on discolored spots occupying a part or all of a leaf, somewhat in rows, oblong, flattened at sides, bullate, about 0.5 mm. broad, 1 mm. long, sometimes confluent and longer, dehiscent at apex; peridium colorless, margin erect, finely lacerate, cells abutted (not overlapping), outer wall and portions in contact very strongly thickened, moderately verrucose, appearing transversely striate in section, inner wall smooth and thin, not easily seen when dry; aeciospores broadly ellipsoid, 15–23 by 20–34 μ; wall colorless, thick, 2.5–3.5 μ, coarsely tuberculate with deciduous tubercles excepta narrow longitudinal stripe; contents orange-yellow fading to colorless.

ON PINACEAE:
Picea excelsa (Lam.) Link, Europe; not yet found in America.

II. Uredinia hypophyllous, scattered or grouped, flat, small, pustular, afterward coalescing into irregular groups, yellowish-red; peridium delicate; urediniospores broadly elliptical or almost globoid, 14–22 by 20–30 μ; wall colorless, medium thick, 1.5–2.5 μ, verrucose with closely set, deciduous tubercles; contents orange-red, fading to colorless.

III. Telia hypophyllous, scattered or grouped, on discolored spots, small, 0.1–0.2 mm. across, flat, at first blood-red; teliospores oblong or cuboid, 10–15 by 13–20 μ, in a series 70-90 μ long, separating easily; wall colorless, thin, 1 μ or less, smooth; contents orange-red, fading to colorless; sporidia ovate, 7 by 11 μ.

ON ERICACEAE:
Ledum glandulosum Nutt., Wyoming.
Ledum groenlandicum Oeder (*L. latifolium* Ait.), New Hampshire, Wisconsin.
TYPE LOCALITY: Upper Lusatia, Germany, on *Abies Picea* (*Picea excelsa*).
DISTRIBUTION: New Hampshire to Wyoming; also in Europe.
ILLUSTRATION: Bot. Zeit. **37**: *pl. 10, f. 7, 8.*
EXSICCATI: Ellis & Ev. N. Am. Fungi *3051*; Ellis & Ev. Fungi Columb. *354.*

6. **Melampsoropsis Arctostaphyli** (Dietel) Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Chrysomyxa Arctostaphyli Dietel, Bot. Gaz. **19**: 303. 1894.

O, I and II. Pycnia, aecia and uredinia unknown.

III. Telia hypophyllous large, 0.3–0.8 mm. across, crowded in small groups on reddish-brown spots, soon naked, flat, roundish or polygonal, waxy, subepidermal, ruptured epidermis conspicuous; teliospores oblong, 13–17 by 23–50 μ, in a series 100–170 μ long wall colorless, smooth, thin, 1–1.5 μ; contents orange-red.

ON ERICACEAE:
Arctostaphylos Uva-Ursi (L.) Spreng., Wisconsin.
TYPE LOCALITY: [Three Lakes], Wisconsin, on *Arctostaphylos Uva-Ursi.*
DISTRIBUTION: Known only from the type locality and vicinity.

7. **Melampsoropsis Piperiana** Arthur, sp. nov.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, small, angular, few in a group or solitary, waxy, becoming somewhat pulverulent; peridium wanting; urediniospores catenulate, oblong to lanceolate, 16–26 by 40–65 μ, narrowed toward each end and pointed or obtuse; wall colorless, coarsely and closely verrucose, medium thick, 1.5–2 μ.

III. Telia unknown.

ON ERICACEAE:
Rhododendron californicum Hook., Oregon, Washington.
Type collected at Seattle, Washington, May, 1892, *C. V. Piper.*
DISTRIBUTION: Northwestern United States.

8. **Melampsoropsis Chiogenis** (Dietel) Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

Chrysomyxa Chiogenis Dietel, Bot. Gaz. **19**: 303. 1894.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, at first bullate, becoming 0.5–0.75 mm. across, roundish or irregular, flat, honey-yellow; peridium delicate, walls thin, smooth; urediniospores catenulate, oblong to linear-oblong, 14–21 by 22–40 μ; wall colorless, coarsely verrucose with somewhat deciduous tubercles, medium thick, 2–3 μ, pores obscure; contents orange-yellow when fresh.

III. Telia hypophyllous, loosely scattered, round, small, 0.2–0.4 mm. across, orange-yellow fading to very pale-yellow, soon naked, ruptured epidermis noticeable; teliospores broadly oblong or squarish, 7–10 by 13–16 μ, in a series 50–80 μ long; wall colorless, smooth, thin, 1 μ.

ON VACCINIACEAE:
Chiogenes hispidula (L.) T. & G. (*C. serpyllifolia* Salisb.), Wisconsin; Newfoundland.
TYPE LOCALITY: [Forest City], Wisconsin, on *Chiogenes hispidula*.
DISTRIBUTION: Northern Wisconsin and Newfoundland.

12. **CRONARTIUM** Fries, Obs. Myc. **1**: 220. 1815.

Hypodermium § *Peridermium* Link, Ges. Nat. Freunde Berlin Mag. **7**: 29. 1815.
Peridermium Schmidt & Kunze, Deuts. Schwämme **6**: 4. 1817.

Cycle of development includes pycnia, aecia, uredinia and telia, with distinct alternating phases; heteroecious. Pycnia and other sori subepidermal.

Pycnia deep-seated, broad and flat.

Aecia erumpent, inflated. Peridium membranous, rupturing at the sides rather than above, 2–4-cells thick, outer surface smooth, inner verrucose. Aeciospores ellipsoid; wall colorless, coarsely verrucose with deciduous tubercles, except a smooth spot on one side.

Uredinia somewhat erumpent. Peridium moderately firm, rupturing above, upper part evanescent; peridial cells isodiametric. Urediniospores borne singly on pedicels, globoid to ellipsoid; wall nearly or quite colorless, echinulate, pores obscure.

Telia erumpent, at first arising from uredinia, the catenulate spores adhering to form a much extended, cylindrical or filiform column, horny when dry. Teliospores oblong to fusiform, one-celled; wall slightly colored, thin, smooth.

Type species, *Cronartium asclepiadeum* Fr. (on *Asclepias* sp.).

Telial host belonging to family Myricaceae.	1. *C. Comptoniae.*
Telial host belonging to family Fagaceae.	2. *C. Quercus.*
Telial host belonging to family Grossulariaceae.	3. *C. ribicola.*
Telial host belonging to family Santalaceae.	4. *C. Comandrae.*
Telial host belonging to family Scrophulariaceae.	5. *C. coleosporioides.*

1. **Cronartium Comptoniae** Arth. Bull. Torrey Club **33**: 29. 1906.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, or somewhat gregarious, round, very small, about 0.1 mm. across, dehiscent by a central rupture, soon wide open and naked, pulverulent; peridium rather firm, cells polygonal, at the sides with walls uniformly thin, about 1 μ, at the top with the inner walls greatly thickened, up to 10 μ; urediniospores oval or obovate, 16–21 by 23–31 μ; wall colorless, rather thick, 2.5 μ, sparsely and finely echinulate.

III. Telial columns hypophyllous, filiform, 40–100 μ thick, 0.5–2 mm. long; teliospores fusiform-oblong, 13–17 by 28–56 μ, obtuse at both ends; walls nearly colorless, smooth, thin, 1–1.5 μ.

ON MYRICACEAE:
Comptonia peregrina (L.) Coult. (*C. asplenifolia* Gaertn., *Myrica asplenifolia* Endl.), Connecticut, Massachusetts, New Jersey, New York, North Carolina, Vermont.
Myrica Gale L., Maine; Ontario.
TYPE LOCALITY: Egg Harbor, New Jersey on *Comptonia peregrina*.
DISTRIBUTION: Atlantic coast from North Carolina northward into Canada.
EXSICCATI: Ellis & Ev. Fungi Columb. *1482, 1724;* Ellis, N. Am. Fungi *285;* Seym. & Earle, Econ. Fungi *216, 217.*

2. **Cronartium Quercus** (Brondeau) Schröt.; Sacc. Michelia **2**: 308. 1881.

Uredo Quercus Brondeau; Duby, Bot. Gall. **2**: 893. 1830.
Peridermium Cerebrum Peck, Bull. Buffalo Soc. Nat. Sci. **1**: 68. 1873.
Cronartium asclepiadeum Quercium Berk. Grevillea **3**: 59. 1874.
Aecidium deformans Mayr, Wald. Nordam. 119. 1890.
Aecidium giganteum Mayr, Wald. Nordam. 120. 1890.—Bot. Centr. **58**: 149. 1894.
Peridermium deformans Tubeuf, Pflanzenkr. 429. 1895.
Peridermium giganteum Tubeuf, Pflanzenkr. 429. 1895.
Aecidium Cerebrum Dietel, in E. &. P. Nat. Pfl. 1**: 79. 1897.
Cronartium Quercuum Miyabe; Shirai, Bot. Mag. Tokyo **13**: 74. 1899.

O. Pycnia uncertain.

I. Aecia caulicolous, forming globoid swellings, 5–25 cm. across, arranged in tortuous lines or cerebroid, at first orange-yellow, bladdery, large; peridium colorless, circumscissile, soon falling away in flakes or sheets, about 2 cells thick, outer surface smooth, inner verrucose, cells roundish or irregularly compressed, walls very thick, lumen small; aeciospores obovate, 17–23 by 25–32 μ; wall colorless, uniformly thick, 2.5–3.5 μ, coarsely verrucose, usually with smooth spot at base and extending up one side, tubercles somewhat deciduous.

ON PINACEAE:
Pinus divaricata (Ait.) Sudw. (*P. Banksiana* Lamb.), Michigan.
Pinus echinata Mill. (*P. mitis* Michx.), Arkansas.
Pinus rigida Mill., New Jersey, New York.
Pinus Taeda L., Mississippi.
Pinus virginiana Mill. (*P. inops* Sol.), District of Columbia, Maryland, Pennsylvania.

II. Uredinia hypophyllous, scattered, round, small, 0.25 mm. across, at first hemispherical, soon dehiscent by apical pore, yellow; peridium delicate or wanting; urediniospores broadly obovate or ellipsoid, 15–20 by 20–32 μ; wall colorless, medium thick, 2–3 μ, evenly echinulate with strong short points.

III. Telial columns hypophyllous, 2–3 mm. long, 150–175 μ thick, filiform; teliospores fusiform or fusiform-oblong, 15–20 by 30–40 μ; wall nearly colorless, rather thick, 2–3 μ, smooth; sporidia oval.

ON FAGACEAE:
Quercus agrifolia Née, California.
Quercus alba L., Alabama, Mississippi, Missouri, New Jersey.
Quercus Castanea Née, Oaxaca.
Quercus digitata (Marsh.) Sudw. (*Q. falcata* Michx.), New Jersey.
Quercus macrocarpa Michx., Kansas, Mississippi.
Quercus marylandica Moench, Maryland.
Quercus minor (Marsh.) Sarg., Alabama.
Quercus nana (Marsh.) Sarg., New Jersey.
Quercus nigra L., Alabama.
Quercus prinoides Willd., Kansas.
Quercus Prinus L., Maryland.
Quercus rubra L., Mississippi.
Quercus tomentosa Willd., Guatemala.
Quercus velutina Lam. (*Q. tinctoria* Michx.), Minnesota, Mississippi, New Jersey, Pennsylvania.
Quercus virginiana Mill. (*Q. virens* Ait.), Florida, Georgia, Mississippi.

TYPE LOCALITY: France, on *Quercus* sp.

DISTRIBUTION: From about the forty-second parallel southward to Florida and Guatemala; also in Europe and Japan.

EXSICCATI: Kellerm. & Swingle, Kan. Fungi *24*; Ellis, N. Am. Fungi *1022*, *1481*; Ellis & Ev. N. Am. Fungi *1881*; Seym. & Earle, Econ. Fungi *214*, *215*; Ellis & Ev. Fungi Columb. *198*; Rav. Fungi Car. **3**: *35*; Rav. Fungi Am. *399*; Rab.-Wint. Fungi Eur. *3418*.

3. **Cronartium ribicola** Fisch. de Waldh. in Rab. Fungi Eur. *1595*. (Hedwigia **11**: 182.) 1872.

Peridermium Strobi Kleb. Abh. Nat. Ver. Bremen **10**: 153. 1887.

O. Pycnia caulicolous, scattered, honey-yellow, forming minute bladdery swellings, exuding a sweet fluid.

I. Aecia caulicolous, forming globose galls; peridium inflated, rupturing at sides, thick, membranous, cells isodiametric, smooth or nearly so on outer surface, verrucose on inner surface; aeciospores ellipsoid, 18–20 by 22–31 μ; wall colorless, coarsely verrucose except an elongate smooth spot, 2–2.5 μ thick, on the smooth side 3–3.5 μ thick.

ON PINACEAE:
Strobus Strobus (L.) Small (*Pinus Strobus* L.), Europe; not yet found in America.

II. Uredinia hypophyllous, thickly scattered in orbicular groups 1–5 mm. across, round, pustular, small, 0.1–0.3 mm. across, dehiscent by a central opening, at first bright-yellow; peridia delicate, inner walls thicker than the outer walls; urediniospores ellipsoid or obovate, 14–22 by 19–35 μ; wall colorless, medium thick, 2–3 μ, sparsely and sharply echinulate.

III. Telial columns hypophyllous, cylindrical, 125–150 μ thick, up to 2 mm. long, curved, bright orange-yellow becoming brownish; teliospores oblong or cylindrical, 8–12 by 30–60 μ, rounded or obtuse at both ends; wall nearly colorless, smooth, rather thick, 2–3 μ.

ON GROSSULARIACEAE:
Ribes longiflorum Nutt., Kansas.
Ribes rubrum L., New York.
TYPE LOCALITY: Stralsund, Germany, on *Ribes aureum*.
DISTRIBUTION: Kansas and New York, collected only once in each locality; also in Europe.

4. **Cronartium Comandrae** Peck, Bot. Gaz. **4**: 128. 1879.

Cronartium asclepiadeum Thesii Berk. Lond. Jour. Bot. **4**: 311. 1845.
Caeoma Comandrae Peck, Bull. Torrey Club **11**: 50. 1884.
Cronartium Thesii Lagerh. Tromsø Mus. Aarsh. **17**: 94. 1895.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous and caulicolous, thickly scattered or somewhat gregarious, round, pustular, small, 0.1–0.2 mm. across, dehiscent by a small central opening; peridium delicate, inner walls somewhat thicker than outer walls; urediniospores globoid, 20–23 by 22–28 μ; wall nearly colorless, rather thin, 1.5–2 μ, sparsely and minutely echinulate.

III. Telial columns hypophyllous and caulicolous, cylindrical, 90–110 μ thick, about 1 mm. long; teliospores oblong or cylindrical, 12–15 by 32–44 μ, obtuse or truncate at both ends; wall nearly colorless, smooth, rather thick, 2–3 μ.

ON SANTALACEAE:
Comandra pallida A. DC., Colorado, Iowa, Montana, Nebraska, South Dakota, Washington, Wyoming; Assiniboia, British Columbia.
Comandra umbellata (L.) Nutt. (*Tnesium umbellatum* L.), California, Illinois, Iowa, Massachusetts, Michigan, New Jersey, New York, Ohio; Ontario.
TYPE LOCALITY: Colorado, on *Comandra pallida*.
DISTRIBUTION: Northern United States and Canada from ocean to ocean.
EXSICCATI: Ellis, N. Am. Fungi *1082*; Ellis & Ev. N. Am. Fungi *4119*; Ellis & Ev. Fungi Columb. *1914*; Griff. West Am. Fungi *298*, *298a*; Seym. & Earle, Econ. Fungi *210*.

5. **Cronartium coleosporioides** (Dietel & Holway) Arthur.

Uredo coleosporioides Dietel & Holway, Erythea **1**: 247. 1893.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous and caulicolous, rather crowded in groups 1–5 mm. across, round, minute, 0.1 mm. across or less, dehiscent by a small central opening; peridium delicate; urediniospores globoid or broadly elliptical, 14–22 by 17–27 μ; wall colorless, thin, 1–1.5 μ, sparsely and very minutely echinulate.

III. Telial columns hypophyllous, cylindrical, short, 0.5 mm. long, 80–110 μ thick; teliospores oblong or fusiform-oblong, 12–17 by 30–52 μ, obtuse at both ends; wall nearly colorless, smooth, thin, 1 μ.

ON SCROPHULARIACEAE:
Castilleja foliolosa H. & A., California.
Castilleja miniata Dougl., Washington.
TYPE LOCALITY: Berkeley, California, on *Castilleja foliolosa*.
DISTRIBUTION: Pacific coast of the United States.

13. **CEROTELIUM** Arth. Bull. Torrey Club **33**: 30. 1906.

Cycle of development imperfectly known, only uredinia and telia recognized, both being subepidermal.

Uredinia somewhat erumpent. Peridium delicate, rupturing above, upper part evanescent; peridial cells isodiametric. Urediniospores borne singly on pedicels, globoid to ellipsoid; wall pale-yellowish, echinulate, pores obscure.

Telia erumpent, at first arising from bed of uredinia, definite, waxy, about as high as broad. Teliospores catenulate, one-celled, oblong or cuboid; wall nearly or quite colorless, thin, smooth.

Type species, *Cerotelium Canavaliae* Arth. (on *Canavalia ensiformis*).

1. **Cerotelium Canavaliae** Arth. Bull. Torrey Club **33**: 30. 1906.

II. Uredinia hypophyllous, gregarious on reddish-brown spots, crowded, small, 0.1–0.2 mm. across, bullate, ruptured epidermis inconspicuous, centrally dehiscent; peridium delicate, cells polygonal, inner walls slightly if any thicker than outer walls; uredinio-spores broadly ellipsoid or globoid, 18–23 by 26–34 μ; wall medium thick, 1–2 μ, pale yellowish, sparsely and minutely echinulate, pores obscure.

III. Telia hypophyllous, columns scarcely extending beyond the peridial walls, about as long as broad; teliospores cylindrical or polygonal, small, 6–9 by 13–17 μ; wall smooth, thin, 0.5–0.8 μ, colorless.

ON FABACEAE:
Canavalia ensiformis DC., Porto Rico.
TYPE LOCALITY: Mayaguez, Porto Rico, on *Canavalia ensiformis*.
DISTRIBUTION: Known only from the type locality.

14. CIONOTHRIX Arthur, gen. nov.

Cycle of development includes only pycnia and telia, both subepidermal.

Pycnia deep-seated, flask-shaped, with ostiolar filaments.

Telia erumpent, the catenulate spores adhering to form a filiform column, horny when dry. Teliospores ovoid, one-celled; wall slightly colored, thin, smooth.

Type species, *Cronartium praelongum* Wint. (on an undetermined composite).

1. **Cionothrix praelonga** (Wint.) Arthur.

Cronartium praelongum Wint. Hedwigia **26**: 24. 1887.

O. Pycnia epiphyllous, in small groups of two to six, punctiform, honey-yellow fading to whitish, conspicuous, subepidermal, deep-seated, flask-shaped, 90–110 μ across; ostiolar filaments numerous, up to 65 μ long.

III. Telia hypophyllous, crowded in small groups, 1–2 mm. across, on yellow spots; telial column arising from a deep-seated bulbous base, filiform, slender, 2–3 mm. long, 50–75 μ thick, flexuous, pale yellowish; teliospores ovoid, 20–24 by 29–35 μ; wall uniformly thin, 1 μ, nearly colorless, smooth; basidiospores oval, 6–9 by 8–14 μ, minutely and sparsely granulose.

ON CARDUACEAE:
Eupatorium populifolium H.B.K., Guatemala.
Eupatorium sp., Veracruz.
TYPE LOCALITY: São Francisco, Prov. St. Catharina, Brazil, on an undetermined composite.
DISTRIBUTION: Southern Mexico and southward; also in South America.

15. **ALVEOLARIA** Lagerh. Ber. Deuts. Bot. Ges. **9**: 346. 1891.

Cycle of development includes telia, and possibly pycnia. Telia subepidermal.

Pycnia unknown, possibly not formed.

Telia erumpent, round, the adherent spores forming an extruded column. Peridium wanting. Teliospores ovoid or prismatic, one-celled, forming detachable, transverse layers; wall colored, rather thin, smooth.

Type species, *Alveolaria Cordiae* Lagerh. (on *Cordia* sp.).

1. **Alveolaria Cordiae** Lagerh. Ber. Deuts. Bot. Ges. **9**: 346. 1891.

O. Pycnia unknown, probably wanting.

III. Telia hypophyllous, in circinating groups, 1–5 mm. across, germinating upon maturity; telial column cylindrical, 0.01–0.5 mm. long, 100–150 μ thick, yellowish fading to whitish; teliospores in layers of 30–60 each, prismatic, 16–20 by 30–48 μ, somewhat rounded at both ends; wall smooth, uniformly thick, 1.5–2 μ, pale golden-yellow.

ON EHRETIACEAE:
Cordia cylindrostachya R. & S., Jamaica.
TYPE LOCALITY: Between Babahoyo and Balsapamba, Ecuador, on *Cordia* sp.
DISTRIBUTION: West Indies; also in South America.

16. **BAEODROMUS** Arth. Ann. Myc. **3**: 19. 1905.

Cycle of development includes only pycnia and telia, both subepidermal.

Pycnia deep-seated, somewhat erumpent, flask-shaped, without ostiolar filaments.

Telia erumpent, definite, round, without peridium. Teliospores catenulate, compacted into a mass about as high as broad, one-celled, ellipsoid; wall brownish, medium thick, smooth.

Type species, *Baeodromus Holwayi* Arth. (on *Senecio cinerarioides*).

Teliospores with uniformly thick walls.
Spores broadly ellipsoid, about 20 by 30 μ. 1. *B. Eupatorii.*
Spores oblong, about 25 by 40 μ. 2. *B. Holwayi.*
Teliospores with walls thicker above. 3. *B. californicus.*

1. **Baeodromus Eupatorii** Arthur.

Dietelia Eupatorii Arth. Bot. Gaz. **40**: 197. 1905.

O. Pycnia amphigenous, numerous, crowded in small groups, punctiform, golden-yellow, rather conspicuous, immersed, subepidermal, flask-shaped, 100–150 μ broad; ostiolar filaments 20–35 μ long.

III. Telia hypophyllous and caulicolous, crowded in orbicular groups, 1–2.5 mm. across, often circinating about the pycnia, on stem causing small swellings up to 1 cm. long, on discolored spots, very small, 0.2–0.3 mm. across, round, somewhat waxy; teliospores broadly ellipsoid, more or less angular and irregular by pressure, 20–25 by 24–36 μ; wall golden-brown, smooth, medium thick, 1.5–2 μ.

ON CARDUACEAE:
Eupatorium pazcuarense H.B.K., Mexico (state).
TYPE LOCALITY: Amecameca, Mexico, on *Eupatorium pazcuarense*.
DISTRIBUTION: Southern Mexico.

2. **Baeodromus Holwayi** Arth. Ann. Myc. **3**: 19. 1905.

O. Pycnia epiphyllous, in small groups opposite the telia, punctiform, golden-yellow, becoming brown, immersed, subepidermal, globose, 100–140 μ in diameter; ostiolar filaments 30 μ long; pycniospores oblong, about 4 by 5 μ.

III. Telia hypophyllous, densely crowded in orbicular groups, 3–5 mm. across, golden-brown, becoming chestnut-brown, centrifugal in development, round, 0.1 mm. across, ruptured epidermis inconspicuous; teliospores catenulate, united into a solid mass, 5–8 in a series, short-cylindrical or oblong, 20–28 by 30–42 μ; wall smooth, golden-brown, uniformly 1.5–2.5 μ thick.

ON CARDUACEAE:
Senecio cinerarioides H.B.K., Mexico (state).
TYPE LOCALITY: Nevada de Toluca, Mexico, on *Senecio cinerarioides*.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Arth. *loc. cit. f. 1.*

3. **Baeodromus californicus** Arth. Ann. Myc. **3**: 19. 1905.

O. Pycnia unknown.

III. Telia amphigenous and caulicolous, densely crowded in more or less orbicular groups, 2–7 mm. across, golden-brown becoming cinnamon-brown, centrifugal in development, round, 0.2 mm. across, pulvinate, early naked, ruptured epidermis inconspicuous; teliospores catenulate, united into a solid mass, 4–6 spores in a series, ellipsoid or obovate, 16–20 by 28–37 μ; wall smooth, pale cinnamon-brown, 2–3 μ, thicker above, 5–8 μ.

ON CARDUACEAE:
Senecio Douglasii DC., California.
TYPE LOCALITY: Lytle Creek, San Bernardino Mountains, California, on *Senecio Douglasii*.
DISTRIBUTION: Southern California.
ILLUSTRATION: Arth. *loc. cit. f. 2.*

17. **ENDOPHYLLUM** Lév. Mém. Soc. Linn. Paris **4**: 208. 1825.

Cycle of development includes only pycnia and telia, both subepidermal.

Pycnia deep-seated, somewhat erumpent, flask-shaped, with ostiolar filaments.

Telia bullate, definite, round, pulverulent. Peridium evanescent, cells resembling spores but flattened. Teliospores catenulate or seemingly compacted without order, one-celled, globoid to ellipsoid; wall colored, medium thick, verrucose.

Type species, *Endophyllum Persoonii* Lév. (on *Sempervivum tectorum*).

Teliospores wholly verrucose. 1. *E. Rivinae.*
Teliospores verrucose, except base. 2. *E. Vernoniae.*

1. **Endophyllum Rivinae** (B. & C.) Arthur.

Aecidium Rivinae B. &. C. Jour. Linn. Soc. **10**: 358. 1869.

O. Pycnia unknown, probably not formed.

III. Telia caulicolous and petiolicolous, numerous, thickly and evenly scattered over swollen and distorted areas, round, 0.3–0.6 mm. across, soon naked, cinnamon-brown, pulverulent, ruptured epidermis inconspicuous; peridia falling apart readily, cells about the size of the spores, flattened, with thicker walls, inner wall very coarsely verrucose, outer smooth; teliospores ellipsoid, more or less angular by pressure, 17–23 by 29–34 μ; wall dark cinnamon-brown, closely and strongly verrucose, medium thick, 1.5–2.5 μ.

ON PETIVERIACEAE:
Rivina octandra L., Cuba.
TYPE LOCALITY: Cuba, on *Rivina octandra*.
DISTRIBUTION: West Indies; also in South America.

2. **Endophyllum Vernoniae** Arthur.

Dietelia Vernoniae Arth. Bot. Gaz. **40**: 198. 1905.

O. Pycnia chiefly epiphyllous, numerous, crowded in orbicular groups, punctiform, golden-yellow becoming brown, prominent, subepidermal, depressed-globoid, or somewhat conical, 130–145 μ broad; central cavity large; ostiolar filaments becoming agglutinate.

III. Telia hypophyllous, crowded opposite the pycnia in annular groups of 2–7, or solitary, round, 0.5 mm. across, soon naked, pulverulent, ruptured epidermis noticeable; peridia falling apart and disappearing with the spores, cells similar to the spores, but flattened and smooth on the outer surface; teliospores ellipsoid or globoid, more or less angular and irregular from pressure, 22–27 by 30–37 μ; wall very pale-yellow, medium thick, 1.5–2 μ, closely and strongly verrucose, except a small spot at the base, the tubercles somewhat deciduous.

ON CARDUACEAE:
Vernonia (*Deppeana* Less.?), Veracruz.
TYPE LOCALITY: Jalapa, Mexico, on *Vernonia*, probably *V. Deppeana*.
DISTRIBUTION: Known only from the type locality.

DOUBTFUL SPECIES

Endophyllum singulare Dietel & Holway, Bot. Gaz. **31**: 336. 1901. On some ericaceous plant from Mexico.

18. **PUCCINIOSIRA** Lagerh. Ber. Deuts. Bot. Ges. **9**: 344. 1891.

Schizospora Dietel, Ber. Deuts. Bot. Ges. **13**: 334. 1895.
Aecidiella Ellis & Kelsey, Bull. Torrey Club **24**: 208. 1897.

Cycle of development includes only pycnia and telia, both subepidermal.

Pycnia somewhat erumpent, flask-shaped, with ostiolar filaments.

Telia erumpent, definite, round. Peridium cylindrical, rupturing at apex. Teliospores catenulate, ovoid or ellipsoid, two-celled by transverse partition; wall nearly or quite colorless, smooth or nearly so.

Type species, *Pucciniosira Triumfettae* Lagerh. (on *Triumfetta* sp.).

Teliospores smooth. 1. *P. pallidula.*
Teliospores minutely verrucose. 2. *P. Brickelliae.*

1. **Pucciniosira pallidula** (Speg.) Lagerh. Tromsø Mus. Aarsh. **16**: 122. 1894.

Coleosporium (?) *pallidulum* Speg. Anal. Soc. Ci. Argent. **17**: 95. 1884.
Pucciniosira Triumfettae Lagerh. Ber. Deuts. Bot. Ges. **9**: 344. 1891.
Aecidiella Triumfettae Ellis & Kelsey, Bull. Torrey Club **24**: 208. 1897.

O. Pycnia epiphyllous, in small groups, crowded, punctiform, honey-yellow becoming blackish, in section globoid, 75–100 μ across; ostiolar filaments free.

III. Telia hypophyllous, in orbicular groups on pale brownish spots, short-cylindrical, 1–1.5 mm. in diameter; peridium colorless or yellowish-white, tardily dehiscent, margin erect, subentire; teliospores oval or obovate, 12–20 by 20–28 μ, obtuse or rounded at both ends, somewhat constricted at septum; wall colorless, smooth, thin, 0.8–1 μ.

ON TILIACEAE:
Triumfetta grandiflora Vahl., Guadeloupe.
Triumfetta Lappula L., Porto Rico.
Triumfetta rhomboidea Jacq., Porto Rico.
Triumfetta semitriloba L., Veracruz; Jamaica; St. Croix.
TYPE LOCALITY: Guarapi, Paraguay, on "Malvaceae," error for *Triumfetta* sp.
DISTRIBUTION: Southern Mexico and throughout the West Indies; also in South America.

2. **Pucciniosira Brickelliae** Dietel & Holway, Bot. Gaz. **24**: 34. 1897.

O. Pycnia epiphyllous, numerous in orbicular groups, rather prominent, punctiform, honey-yellow, globose, 120–145 μ broad; ostiolar filaments large, 2–4 μ thick, 60–120 μ long.

III. Telia hypophyllous and caulicolous, numerous in orbicular groups, 3–8 mm. across, cylindrical, a little less than 0.5 mm. in diameter; peridium colorless, margin erect, erose and coarsely slit; teliospores yellowish, ellipsoid, 18–24 by 28–36 μ, angular from pressure, rounded at both ends, slightly or not constricted at septum, easily separating into halves; wall almost colorless, thin, 0.8–1 μ, closely and minutely verrucose.

ON CARDUACEAE:
Coleosanthus Cavanillesii (A. Gray) Cass., Guatemala.
Coleosanthus secundiflorus (A. Gray) Kuntze (*Brickellia secundiflora* A. Gray), Hidalgo.
Coleosanthus sp., Jalisco, Mexico (state).
TYPE LOCALITY: Rio Hondo, near City of Mexico, on *Brickellia* sp.
DISTRIBUTION: Central and southern Mexico, and Central America.
EXSICCATI: Sydow, Ured. *1890*.

Family 3. **AECIDIACEAE**

By Joseph Charles Arthur

Basidia external. Telia usually erumpent, solid or pulverulent; teliospores fascicled or free, pedicelled, wall firm, or with an outer gelatinous layer, overlaid by cuticle.

Pycnia and other sori originating beneath the cuticle or between the epidermis and mesophyl; telia erumpent, teliospores with fascicled or simple pedicels, wall firm, pores one in a cell and apical; aecia when present with peridium rupturing at apex, or without peridium; uredinia when present without peridium or encircling paraphyses, spores usually darker and thicker above, borne singly on pedicels, sometimes with paraphyses intermixed. Subfamily Raveneliatae.

Teliospores united into a head on a compound pedicel.

Life-cycle with all spore-forms. 1. Neoravenelia.

Life-cycle with pycnia, aecia and telia. 2. Cystingophora.

Life-cycle with pycnia, uredinia and telia. 3. Ravenelia.

Life-cycle with pycnia and telia. 4. Dendroecia.

Teliospores free, one to four on a simple pedicel, all but one lateral.

Teliospores flattened laterally. 5. Dicheirinia.

Teliospores flattened above and below.

Life-cycle with pycnia, uredinia and telia. 6. Pileolaria.

Life-cycle with pycnia and telia. 7. Discospora.

Teliospores not flattened, but urediniospores flattened laterally. 8. Hemileia.

Teliospores free, two to eight at apex of a common stalk.

Life-cycle with all spore-forms. 9. Tranzschelia.

Life-cycle with pycnia and telia. 10. Polythelis.

Pycnia subcuticular, other sori subcuticular or subepidermal; telia erumpent, teliospores free, wall with a more or less evident gelatinous layer, pores when more than one in a cell placed laterally; aecia when present without peridium; uredinia when present without peridium, but usually encircled by paraphyses, spores borne singly on pedicels. Subfamily Uropyxidatae.

Teliospores with evident gelatinous layer, the pores lateral.

Teliospores three-celled. 11. Phragmopyxis.

Teliospores two-celled.

Life-cycle with pycnia, uredinia and telia. 12. Uropyxis.

Life-cycle with pycnia and telia. 13. Calliospora.

Teliospores with obscure gelatinous layer, the pores apical.

Teliospores with appendaged pedicels. 14. Prospodium.

Teliospores without appendaged pedicels. 15. Nephlyctis.

Pycnia subcuticular, other sori subepidermal; telia erumpent, teliospores free, wall firm, pores when more than one in a cell placed laterally; aecia when present without peridium; uredinia when present without peridium, but usually encircled by paraphyses, spores borne singly on pedicels. Subfamily Phragmidiatae

Teliospores mostly tuberculate, the pores more than one and lateral.

Life-cycle with all spore-forms. 16. Phragmidium.

Life-cycle with pycnia, aecia and telia. 17. Earlea.

Life-cycle with pycnia, uredinia and telia.

Teliospores one-celled. 18. Trachyspora.

Teliospores three-celled. 19. Triphragmium.

Life-cycle with pycnia and telia.

Teliospores one-celled. 20. Ameris.

Teliospores three-celled. 21. Nyssopsora.

Teliospores mostly smooth, the pores one in a cell and apical.

Life-cycle with pycnia, aecia and telia.

Teliospores two-celled. 22. Gymnoconia.

Teliospores many-celled. 23. Xenodochus.

Life-cycle with pycnia, uredinia and telia.

Teliospores one-celled. 24. Spirechina.

Teliospores three- to thirteen-celled. 25. Kuehneola.

Pycnia and other sori subepidermal; telia erumpent, teliospores free, but imbedded more or less in a gelatinous matrix, wall firm, pores usually more than one in a cell and lateral; aecia when present with peridium, dehiscent by longitudinal slits; uredinia unknown. Subfamily Aecidiatae.

Life-cycle with pycnia, aecia and telia. 26. Aecidium.

Pycnia and other sori subepidermal; telia erumpent or sometimes indehiscent, teliospores free, wall firm, pores one in a cell and apical; aecia when present with peridium rupturing at apex, or without peridium; uredinia when present without peridium, rarely with encircling paraphyses, spores borne singly on pedicels. Subfamily Dicaeomatae.

Teliospores colorless; aecia more or less indefinite, usually without peridium.

Life-cycle with all spore-forms. 27. ERIOSPORANGIUM.
Life-cycle with pycnia, uredinia and telia. 28. ARGOTELIUM.
Life-cycle with pycnia and telia. 29. POLIOMA.
Teliospores colored; aecia definite, usually with peridium.
Life-cycle with all spore-forms.
Teliospores one-celled. 30. NIGREDO.
Teliospores two-celled. 31. DICAEOMA.
Life-cycle with pycnia, aecia and telia.
Teliospores one-celled. 32. UROMYCOPSIS.
Teliospores two-celled. 33. ALLODUS.
Life-cycle with pycnia, uredinia and telia.
Teliospores one-celled. 34. KLEBAHNIA.
Teliospores two-celled. 35. BULLARIA.
Life-cycle with pycnia and telia.
Teliospores one-celled. 36. TELOSPORA.
Teliospores two-celled. 37. DASYSPORA.

1. **NEORAVENELIA** Long, Bot. Gaz. **35**: 131. *pl. 3, f. 24.* 1903.

Cycle of development includes pycnia, aecia, uredinia and telia, showing alternating phases; autoecious. Pycnia subcuticular, other sori subepidermal.

Pycnia depressed-conical.

Aecia erumpent, without peridium. Aeciospores catenulate, oblong; wall colored, closely verrucose.

Uredinia erumpent, definite, without peridium. Urediniospores borne singly on pedicels, with or without paraphyses intermixed, ovoid or somewhat fusiform; wall colored, echinulate or verrucose, pores equatorial.

Telia erumpent, definite. Teliospores fascicled on compound stalks, forming heads bordered by hyaline cysts, each spore one- or two-celled; wall colored, smooth or verrucose.

Type species, *Ravenelia Holwayi* Dietel (on *Prosopis juliflora*).

1. **Neoravenelia Holwayi** (Dietel) Long, Bot. Gaz. **35**: 131. 1903.

Ravenelia Holwayi Dietel, Hedwigia **33**: 61. 1894.

O. Pycnia amphigenous, punctiform, gregarious, preceding or accompanying the aecia, dark golden-brown, subcuticular, hemispherical or rounded-conical, 50–80 μ wide, 25–40 μ high.

I. Aecia amphigenous, crowded on hypertrophied areas, irregularly oblong, 1–3 mm. long, subepidermal, soon naked, pulverulent, dull-brown or ochraceous, ruptured epidermis conspicuous; peridium wanting; aeciospores oblong or linear-oblong, angular and irregular, 13–21 by 24–42 μ; wall golden-brown, thick, 2–3.5 μ, evenly and closely verrucose, pores 4, equatorial.

II. Uredinia amphigenous, round or oblong, soon naked, subepidermal, cinnamon-brown, or chestnut-brown when the paraphyses are numerous, pulverulent, ruptured epidermis conspicuous; paraphyses intermixed with the spores, capitate, 20–27 by 30–50 μ, smooth, heads in part or wholly chestnut-brown, often very dark, wall thick, 5–10 μ, stipe pale, nearly or quite solid; urediniospores obovate-fusiform or oval, 15–19 by 24–42 μ; wall golden-brown, thick, 2.5–4 μ, apex thicker, 4–7 μ, often acute, evenly and sparsely echinulate-verrucose, pores 4, equatorial.

III. Telia amphigenous, round or oblong, large, 1–2 mm. long, gregarious, often circinating, subepidermal, blackish, shining, ruptured epidermis conspicuous; paraphyses none; teliospore-heads dark chestnut-brown, opaque, often paler beneath, 7–10 cells across, 65–125 μ in diameter, smooth; cysts 15–20, globose, pendent from beneath the whole head, not united to one another; pedicel colorless, short, deciduous.

ON MIMOSACEAE:
Prosopis juliflora (Sw.) DC., California, Texas.
TYPE LOCALITY: San Bernardino, California, on *Prosopis juliflora*.
DISTRIBUTION: Texas to southern California.
ILLUSTRATIONS: Long, *l. c. pl. 3, f. 24*; Hedwigia **33**: *pl. 5, f. 26.*

2. CYSTINGOPHORA Arthur, gen. nov.

Cycle of development includes pycnia, aecia and telia, with distinct alternating phases; autoecious. Pycnia subcuticular, other sori subepidermal.

Pycnia low-hemispherical; hymenium flat; ostiolar filaments wanting.

Aecia erumpent, cylindrical. Peridium dehiscent at apex, margin erect. Aeciospores ovoid; wall colored, finely verrucose.

Telia erumpent, definite. Teliospores fascicled on compound stalks, forming heads bordered by hyaline cysts, each spore one- or two-celled; wall colored, smooth or verrucose.

Type species, *Ravenelia Hieronymi* Speg. (on *Acacia Cavenia*).

1. Cystingophora Hieronymi (Speg.) Arthur.

Ravenelia Hieronymi Speg. Anal. Soc. Ci. Arg. **12**: 66. 1881.
Aecidium Hieronymi Speg. Anal. Soc. Ci. Arg. **12**: 78. 1881.
Ravenelia Mimosae P. Henn. Hedwigia **34**: 95. 1895.
Ravenelia Acaciae-Farnesianae P. Henn. Hedwigia **34**: 321. 1895.

O. Pycnia caulicolous, numerous, thickly scattered, preceding or among the aecia, not conspicuous, subcuticular, cinnamon-brown, becoming darker, flattened hemispherical, small, 55–90 μ in diameter by 25–30 μ high.

I. Aecia chiefly caulicolous, thickly scattered over hypertrophied areas, cylindrical, 0.2–0.3 mm. in diameter by 0.5–0.8 mm. high, subepidermal; peridium erect, pale-yellow, margin erose, cells ovoid in surface view, overlapping; outer wall thick, 5–7 μ, transversely striate, inner wall much thinner, smooth; aeciospores ovoid or irregularly oblong, 12–18 by 19–30 μ; wall cinnamon-brown, thick, 2–3 μ, very minutely verrucose, appearing smooth.

III. Telia chiefly caulicolous, scattered over hypertrophied areas, rounded, 0.4–0.6 mm. across, sometimes larger, tardily naked, dark chestnut-brown, ruptured epidermis noticeable; teliospore-heads chestnut-brown, hemispherical or lenticular-globoid, 6–9 cells across, 40–95 μ in diameter, smooth; cysts 10–14, globose or ovoid, pendent from beneath the head; pedicel hyaline, 30–60 μ long.

ON MIMOSACEAE:
Vachellia Farnesiana (L.) W. & A. (*Acacia Farnesiana* Willd., *A. Cavenia* Hook. & Arn.), Texas; Durango, Michoacan.
TYPE LOCALITY: Sierra Chica de Cordoba, Argentina, on *Acacia Cavenia*.
DISTRIBUTION: Southern Texas to southern Mexico; also in South America.
ILLUSTRATION: Hedwigia **33**: *pl. 2, f. 5; pl. 5, f. 27a.*

3. RAVENELIA Berk. Gard. Chron. **1853**: 132. 1853.

Pleoravenelia Long, Bot. Gaz. **35**: 127. 1903.

Cycle of development includes pycnia, uredinia, and telia, with more or less distinct alternating phases. Pycnia and other sori either subcuticular or subepidermal.

Pycnia depressed-conical.

Uredinia erumpent, definite, without peridium. Urediniospores borne singly on pedicels, with or without intermixed paraphyses, ellipsoid to nearly fusiform; wall colored, often paler below, echinulate or verrucose, pores zonal or scattered.

Telia erumpent, definite. Teliospores fascicled on compound stalks, forming heads bordered by hyaline cysts, each spore one- or two-celled; wall colored, smooth or verrucose.

Type species, *Ravenelia glandulosa* B. & C. (on *Tephrosia* sp.).

Host belonging to family Mimosaceae.
- Uredinial paraphyses absent.
  - Urediniospores with wall thicker above.
    - Pores equatorial, 3. — 1. *R. Ingae.*
    - Pores equatorial, 4–6. — 2. *R. Pithecolobii.*
  - Urediniospores with evenly thick wall; pores equatorial, 3. — 3. *R. Entadae.*
- Uredinial paraphyses present.
  - Urediniospores with wall thicker above.
    - Pores in one transverse zone, which is equatorial. — 4. *R. arizonica.*
    - Pores in one transverse zone, which is subequatorial. — 5. *R. Leucaenae.*
  - Urediniospores with evenly thick wall.
    - Pores in one transverse zone, equatorial.
      - Paraphyses thickened above, cylindrical. — 6. *R. Leucaenae-microphyllae.*
      - Paraphyses thickened above, clavate-capitate. — 7. *R. mexicana.*

Paraphyses not thickened above, cylindrical.	8. *R. gracilis.*
Pores in two transverse zones.	
Pore-zones equidistant from equator.	
Urediniospores mostly oblong.	9. *R. siliquae.*
Urediniospores mostly ellipsoid.	10. *R. Acaciae-pennatulae.*
Pore-zones at and below the equator.	11. *R. versatilis.*
Pores scattered, numerous.	
Paraphyses with wall thicker above.	
Paraphyses clavate, much thicker at apex.	12. *R. expansa.*
Paraphyses capitate to clavate-capitate.	
Paraphyses moderately thickened at apex; urediniospore-wall thin.	13. *R. igualica.*
Paraphyses moderately thickened at apex; urediniospore-wall medium thick.	14. *R. texensis.*
Paraphyses slightly thicker at apex than on sides; urediniospore-wall thin.	15. *R. mimosicola.*
Paraphyses cylindrical to spatulate, slightly thicker at apex.	16. *R. fragrans.*
Paraphyses with wall evenly thick.	
Paraphyses clavate; urediniospores echinulate-verrucose.	17. *R. Mimosae-caeruleae.*
Paraphyses clavate-capitate or spatulate; urediniospores verrucose.	18. *R. Mimosae-albidae.*
Host belonging to family Caesalpiniaceae.	
Uredinial paraphyses absent; urediniospores with evenly thick wall; pores scattered.	
Urediniospores closely verrucose.	19. *R. cassiaecola.*
Urediniospores finely echinulate-verrucose.	20. *R. indica.*
Urediniospores sparsely echinulate.	21. *R. mesilliana.*
Urediniospores thickly echinulate.	22. *R. portoricensis.*
Uredinial paraphyses present.	
Urediniospores with evenly thick wall; pores scattered.	
Paraphyses with evenly thick wall, colorless.	
Paraphyses cylindrical, the walls thick; urediniospore-wall thick.	23. *R. Longiana.*
Paraphyses clavate-capitate, the walls thin.	
Urediniospore-wall medium thin.	24. *R. spinulosa.*
Urediniospore-wall medium thick.	25. *R. papillifera.*
Paraphyses with evenly thick wall, colored, clavate or spatulate; urediniospore-wall medium thick.	26. *R. inconspicua.*
Paraphyses with wall thicker above, colored, capitate, much thicker at apex; urediniospore-wall thin.	27. *R. Humphreyana.*
Urediniospores with wall thicker above, pores in one transverse zone, superequatorial.	28. *R. Caesalpiniae.*
Host belonging to family Fabaceae.	
Uredinial paraphyses absent.	
Urediniospores with wall thicker above; pores in one transverse zone, approximately equatorial.	29. *R. Talpa.*
Urediniospores with evenly thick walls.	
Pores in one transverse zone; urediniospores verrucose.	30. *R. epiphylla.*
Pores scattered.	
Urediniospores echinulate-verrucose.	31. *R. irregularis.*
Urediniospores echinulate.	
Wall thin, pale-yellow.	32. *R. caulicola.*
Wall thick, chestnut-brown.	33. *R. Brongniartiae.*
Pores scattered, but near equator; urediniospore-wall thick, chestnut-brown.	34. *R. similis.*
Uredinial paraphyses present; urediniospores with evenly thick wall, pores scattered.	
Paraphyses with evenly thick wall.	
Urediniospore-wall thin.	35. *R. Piscidiae.*
Urediniospore-wall thick.	36. *R. laevis.*
Paraphyses with wall thicker above.	37. *R. Indigoferae.*
Host belonging to family Euphorbiaceae.	
Uredinial paraphyses present; urediniospores with evenly thick wall, pores in one transverse zone.	38. *R. appendiculata.*

1. **Ravenelia Ingae** (P. Henn.) Arthur.

Uredo Ingae P. Henn. Hedwigia Beibl. **38**: 69. 1899.
Uredo excipulata Sydow, Ann. Myc. **2**: 350. 1904.

O. Pycnia amphigenous, numerous, in crowded orbicular groups 1–3 mm. across, subcuticular, dark-brown, depressed-hemispherical, 85–112 μ across, 25–35 μ high.

II. Uredinia amphigenous causing more or less hypertrophy, at first surrounding the pycnia, subepidermal, small, crowded and confluent, forming groups or rings 2–8 mm.

across, tardily naked, cinnamon-brown, pulverulent, ruptured epidermis conspicuous; paraphyses none; urediniospores obovate or globoid, 14–17 by 21–26 μ; wall sparsely echinulate-verrucose, pale-yellow, medium thick, 1.5–2 μ, thicker above, 3–5 μ, pores 3, equatorial.

III. Telia unknown.

ON MIMOSACEAE:
Inga Inicuil Cham. & Schlecht., Veracruz.
Inga vera Willd., Porto Rico.
TYPE LOCALITY: Blumenau, Brazil, on *Inga* sp.
DISTRIBUTION: West Indies and eastern Mexico; also in South America.

2. **Ravenelia Pithecolobii** Arth. Bot. Gaz. **39**: 394. 1905.

O. Pycnia unknown.

II. Uredinia amphigenous, small, rounded or oblong, 0.3–1 mm. across, subepidermal, tardily dehiscent, cinnamon-brown, long covered by the overarching and discolored epidermis; paraphyses none; urediniospores elliptical or broadly oval, 15–22 by 24–32 μ; wall golden-yellow, medium thick, 2–3 μ, thicker at apex, 3–5 μ, sparsely and papillosely echinulate, pores 4–6, equatorial.

III. Telia amphigenous, scattered, small, round, at first bullate, subepidermal, tardily naked, chestnut-brown; paraphyses none; teliospore-heads chestnut-brown, 6–8 cells across, 70–90 μ in diameter, each spore bearing 2 or 3 slightly curved tubercles, 5–7 μ long, acute, pale-brownish; cysts appressed beneath the head, extending from periphery to pedicel, united laterally; pedicel colorless, short, deciduous.

ON MIMOSACEAE:
Pithecolobium dulce (Roxb.) Benth., Jalisco.
Pithecolobium Unguis-Cati (L.) Benth., Florida.
TYPE LOCALITY: Guadalajara, Mexico, on *Pithecolobium dulce*.
DISTRIBUTION: Southern Florida and central Mexico.

3. **Ravenelia Entadae** Lagerh. & Dietel, Hedwigia **33**: 62. 1894.

O. Pycnia unknown.

II. Uredinia chiefly epiphyllous, circinating or scattered, subepidermal, tardily naked, opening by a slit or pore, cinnamon-brown, ruptured epidermis conspicuous; paraphyses none; urediniospores broadly ellipsoid or slightly obovate, 10–16 by 14–19 μ; wall medium thick, 1.5–2.5 μ, golden-brown, echinulate with short points, pores about 3, approximately equatorial.

III. Telia epiphyllous in circinating groups, long covered by overarching and discolored epidermis, chestnut-brown; teliospore-heads light chestnut-brown, flattened, smooth, 95–130 μ broad, 7–10 cells across, easily separated by pressure, single spores 14–16 μ broad; cysts small, globose or ovate, often flattened by lateral pressure, of same number as the spores; pedicel deciduous.

ON MIMOSACEAE:
Entada polystachya DC., Panama.
TYPE LOCALITY: Panama, on *Entada polystachya*.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Hedwigia **33**: *pl. 2, f. 9.*

4. **Ravenelia arizonica** Ellis & Ev. Bull. Torrey Club **22**: 363. 1895.

O. Pycnia unknown.

II. Uredinia amphigenous, round, 0.5 mm. across, crowded over large areas, sometimes forming woody galls, subepidermal, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; paraphyses plentifully intermixed with the spores, capitate, rarely spatulate, 18–22 by 40–60 μ, heads chestnut-brown, thick-walled, stipe nearly or quite colorless and solid; urediniospores fusiform-oval, 16–22 by 28–42 μ; wall cinnamon-brown, darker above, thick, 2–3 μ, thicker at apex, 3–6 μ, echinulate-verrucose, pores 4, equatorial.

III. Telia amphigenous, round, 0.5–1 mm. across, scattered, subepidermal, chocolate-brown, shining, ruptured epidermis evident; paraphyses as in the uredinia but less abundant; teliospore-heads chocolate-brown, 6–8 cells across, 60–100 μ in diameter, each spore bearing a central spine, 4–6 μ long, tapering to a blunt point, curved, pale-brown; cysts pendent, not much united to one another, peripheral; pedicel colorless, short, deciduous.

ON MIMOSACEAE:
Prosopis juliflora (Sw.) DC., Texas.
Prosopis velutina Wooton, Arizona.
Prosopis sp., California.
TYPE LOCALITY: Tucson, Arizona, on *Prosopis juliflora*.
DISTRIBUTION: Southwestern United States from Texas to southern California.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 2, f. 16.*
EXSICCATI: Ellis & Ev. Fungi Columb. *1372, 1481*; Griff. West Am. Fungi *252, 252a, 254.*

5. **Ravenelia Leucaenae** Long, Bot. Gaz. **35**: 126. 1903.

O. Pycnia unknown.

II. Uredinia chiefly epiphyllous, round, small, 0.2–0.5 mm. across, scattered, subcuticular, soon naked, pulverulent, cinnamon-brown, ruptured cuticle noticeable; paraphyses mostly encircling the sorus, clavate, 15–18 by 40–60 μ, wall smooth, thin, nearly colorless, fulvous at apex; urediniospores linear-oblong or linear-obovate, 15–18 by 30–50 μ; wall thin, 1–2 μ, slightly thicker above, upper half pale cinnamon-brown, lower half nearly colorless, sparsely echinulate-verrucose, pores 4, subequatorial.

III. Telia chiefly epiphyllous, small, 0.3–1 mm. across, scattered, subcuticular, ruptured cuticle noticeable, blackish; teliospore-heads chestnut-brown, 5–6 cells across, 70–100 μ in diameter, each spore bearing 4 or 5 small tubercles, 3–6 μ long by 3 μ thick; cysts flattened against the under side of the head, extending from the periphery to the pedicel; pedicel colorless, short, deciduous.

ON MIMOSACEAE:
Leucaena diversifolia Benth., Oaxaca.
Leucaena esculenta DC., Guerrero, Jalisco, Oaxaca.
Leucaena sp., Puebla.
TYPE LOCALITY: Etla, Oaxaca, Mexico, on *Leucaena diversifolia*.
DISTRIBUTION: Southern Mexico.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 3, f. 23.*
EXSICCATI: Sydow, Ured. *1888, 1889.*

6. **Ravenelia Leucaenae-microphyllae** Dietel, Beih. Bot. Centr. **20**[2]: 375. 1906.

O. Pycnia unknown.

II. Urediniospores intermixed with the teliospores, few seen, broadly ellipsoid; wall pale-brown, thin, finely echinulate, pores equatorial, about 4.

III. Telia epiphyllous, scattered, small, 0.2–0.5 mm. across, subepidermal, blackish-brown, shining, ruptured epidermis inconspicuous; paraphyses few, cylindrical or somewhat clavate, 7–15 by 45–60 μ, walls smooth, thin, slightly thickened and tinted above, pale below; teliospore-heads chestnut-brown, 6–10 cells across, 70–100 μ in diameter, smooth; cysts hyaline, coherent, appressed, bursting in water; pedicel hyaline, deciduous.

The position of this species is uncertain, as only telia and a very few urediniospores have been seen. The latter may not represent true soral development. The telia are almost or quite like those of the South American *R. australis* Dietel & Neger, on *Acacia Cavenia*, the two species being kept separate chiefly on account of the hosts.

ON MIMOSACEAE:
Leucaena microphylla Benth., Guerrero.
TYPE LOCALITY: Iguala, State of Guerrero, Mexico, on *Leucaena microphylla*.
DISTRIBUTION: Known only from the type locality.

7. **Ravenelia mexicana** Tranz.; Dietel, Hedwigia **33**: 370. 1894.

O. Pycnia unknown.

II. Urediniospores intermixed with the teliospores, few seen, globoid or ellipsoid, 18–20 by 22–25 μ; walls pale-brown above, nearly colorless below, thin, echinulate, pores 4, equatorial.

III. Telia amphigenous, scattered, small, subcuticular, brownish, ruptured cuticle conspicuous; paraphyses clavate-capitate, 18–20 by 40–55 μ, walls thickened above, light chestnut-brown at apex, colorless below; teliospore-heads chestnut-brown, 4–6 cells across, 60–80 μ in diameter, each spore bearing 2–4 blunt, curved, hyaline tubercles, short above, lateral ones longer, ranging up to 8 μ; cysts hyaline, pendent, peripheral, swelling and bursting in water; pedicel weak, short, deciduous.

ON MIMOSACEAE:
Calliandra grandiflora Benth., Jalisco.
TYPE LOCALITY: Mountains near Chapala, Jalisco, Mexico, on *Calliandra grandiflora*.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 3, f. 25*.

8. **Ravenelia gracilis** Arth. Bot. Gaz. **39**: 393. 1905.

O. Pycnia amphigenous, crowded in small groups, punctiform, prominent, fuscous, subcuticular, hemispherical, 60–100 μ broad, and half as high.

II. Uredinia epiphyllous, scattered, small, less than 0.25 mm. in diameter, round, mammillose, subepidermal, dehiscent by central, irregular rupture, the encircling epidermis forming an aecidioid cup; paraphyses numerous, intermixed with the spores, or more often only peripheral, cylindrical, 7–10 by 40–60 μ, somewhat contorted, walls smooth, thin, nearly or quite colorless; urediniospores elliptical or obovate-oblong, 16–21 by 30–40 μ; wall rather thin, 1.5–2.5 μ, golden-brown, strongly and evenly echinulate, pores 4–6, equatorial.

III. Telia epiphyllous, scattered, small, resembling the uredinia but without paraphyses, subepidermal; teliospore-heads chestnut-brown, 5–7 cells across, 75–100 μ in diameter, each spore bearing 4–7 slender, nearly colorless tubercles, 3–4 μ high; cysts delicate, appressed beneath the head, extending from periphery to pedicel, united laterally; pedicel short, colorless, deciduous.

ON MIMOSACEAE:
Gen. et sp. indet., San Luis Potosi.
TYPE LOCALITY: Cardenos, Mexico, on unknown host.
DISTRIBUTION: Known only from the type locality.

9. **Ravenelia siliquae** Long, Bot. Gaz. **35**: 118. 1903.

O. Pycnia unknown.

II. Uredinia fruticolous, round, large, 1–4 mm. across, scattered, often confluent, subcuticular, early naked, pulverulent, cinnamon-brown, ruptured cuticle conspicuous; paraphyses few, intermixed with the urediniospores, small and inconspicuous, clavate, 6–7 by 40–45 μ, wall thin, 1 μ, thicker at apex, 1–2 μ, colorless below, pale golden-yellow above; urediniospores oblong to obovate-fusiform, 11–15 by 20–33 μ; wall light cinnamon-brown, medium thin, 1.5–2 μ, densely and strongly verrucose, pores 8, in two irregular transverse zones, equidistant from equator.

III. Telia unknown.

ON MIMOSACEAE:
Vachellia Farnesiana (L.) W. & A. (*Acacia Farnesiana* Willd.), Jalisco, Oaxaca.
TYPE LOCALITY: Etla, Oaxaca, Mexico, on *Acacia Farnesiana*.
DISTRIBUTION: Southern Mexico.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 2, f. 7*.

10. **Ravenelia Acaciae-pennatulae** Dietel, Beih. Bot. Centr. **20**[2]: 373. 1906.

O. Pycnia unknown.

II. Uredinia epiphyllous, scattered, round, small, 0.2–0.4 mm. across, subcuticular, early naked, cinnamon-brown, pulverulent, ruptured cuticle conspicuous; paraphyses thickly intermixed with the spores, small and inconspicuous, clavate, 9–15 by 40–50 μ, stipe slender, wall thin, 1 μ, slightly thicker at apex, 1–2 μ, pale golden-yellow above, colorless below; urediniospores ellipsoid or broadly oblong, 15–22 by 20–33 μ; wall dark cinnamon-brown, medium thick, 1.5–2.5 μ, densely and strongly verrucose, pores 8, in two irregular transverse zones of four each, equidistant from equator.

III. Telia epiphyllous, scattered, round or irregular, small, 0.3–0.5 mm. across, subcuticular, early naked, blackish-brown, shining, ruptured cuticle noticeable; paraphyses none; teliospore-heads chestnut-brown, 5–7 cells across, 60–100 μ in diameter, each spore set with 7–9 short, semihyaline papillae, 1–2 μ long; cysts pendent beneath entire head, hyaline, swelling and bursting readily in water; pedicel short, hyaline, deciduous.

ON MIMOSACEAE:
Acacia cochliacantha Humb. & Bonpl., Guerrero, Puebla.
Acacia pennatula Benth., Oaxaca.
TYPE LOCALITY: Etla, State of Oaxaca, Mexico, on *Acacia pennatula*.
DISTRIBUTION: Southern Mexico.

11. **Ravenelia versatilis** (Peck) Dietel, Hedwigia **33**: 64. 1894.

Uromyces versatilis Peck, Bot. Gaz. **7**: 56. 1882.
Uromyces deciduus Peck, Ann. Rep. N. Y. State Mus. **45**: 25. 1893.
Ravenelia decidua Holway; Dietel, Hedwigia **33**: 370. 1894.

O. Pycnia unknown.

II. Uredinia amphigenous, often forming witches' brooms, thickly covering large areas, sometimes confluent, irregularly orbicular or on the branches oblong, discoid, subcuticular, early naked, dark cinnamon-brown, surrounded by a brown marginal stroma, ruptured cuticle noticeable; paraphyses very numerous, intermixed with the spores, capitate, 40–60 μ long, heads 12–20 μ broad, wall thin, 1–1.5 μ, often thicker above, 2–5 μ, colored above, hyaline below; urediniospores oblong or ovate-oblong, 12–17 by 24–33 μ; wall thin, 1–1.5 μ, very slightly thicker above, minutely and sparsely echinulate, more prominent below, upper half golden-brown, lower half paler, or nearly colorless, pores 8, equidistant in two zones of 4 each, one in the equator, the other near the base.

III. Telia amphigenous, scattered, round or oval, small, 1 mm. or less across, subcuticular, soon naked, ruptured cuticle noticeable; teliospore-heads chestnut-brown, 5–8 cells across, 60–100 μ in diameter, smooth, or with very faint tubercles on the marginal cells; cysts oblong-ovate, 24–30 μ long, hyaline, peripheral, slow to burst in water; pedicel tinted, short, deciduous.

ON MIMOSACEAE:
Acacia Greggii A. Gray, Arizona, California, Texas.
TYPE LOCALITY: Arizona, on *Acacia Greggii*.
DISTRIBUTION: Southern border of the United States from Texas to California.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 2. f. 3.*

12. **Ravenelia expansa** Dietel & Holway, Bot. Gaz. **24**: 35. 1897.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered, round, small, about 0.5 mm. across, subcuticular, early naked, pulverulent, cinnamon-brown, ruptured cuticle noticeable; paraphyses intermixed with the spores, numerous, clavate, 10–13 by 30–65 μ, smooth, wall of apex much thickened, 3–7 μ, wall of sides and stipe rather uniform, 1.5–2 μ, dark golden-brown above, paler below; urediniospores globoid or broadly ellipsoid, 12–18 by 15–20 μ; wall cinnamon-brown, thin, about 1 μ, closely and finely echinulate-verrucose, pores 6–10, scattered.

III. Telia amphigenous, scattered, round or irregular, large, 0.5–2 mm. or more across, subcuticular, early naked, dark chesnut-brown, shining, ruptured cuticle conspicuous; paraphyses none; teliospore-heads light chestnut-brown, 5–7 cells across, 65–90 μ in diameter, each spore bearing 3–5 short pale-brown wart-like papillae; cysts pendent from insertion of pedicel, globoid or ovoid, swelling in water but slow to burst, 6–8; pedicel hyaline, short.

ON MIMOSACEAE:
Acacia tequilana S. Wats., Jalisco.
TYPE LOCALITY: Guadalajara, Mexico, on *Acacia tequilana*.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 2, f. 10.*

13. **Ravenelia igualica** Arthur, sp. nov.

O. Pycnia unknown.

II. Uredinia chiefly hypophyllous, scattered, round, small, 0.2–0.3 mm. across, subcuticular, soon naked, cinnamon-brown, ruptured cuticle noticeable; paraphyses intermixed with the spores, capitate or clavate-capitate, 9–12 by 35–50 μ, smooth, wall of apex thickened, 3–5 μ, thinner at the sides 1–1.5 μ, stipe usually solid, golden-brown above, paler below; urediniospores globoid or broadly ellipsoid, 14–16 by 16–19 μ; wall pale cinnamon-brown, thin, about 1 μ, finely echinulate-verrucose, pores 8–10, scattered.

III. Telia chiefly hypophyllous, scattered, irregular, small, 0.3–0.8 mm. across, subcuticular, early naked, blackish-brown, shining, ruptured cuticle not conspicuous; paraphyses none; teliospore-heads chestnut-brown, 4–7 cells across, 60–90 μ in diameter, each spore bearing 5–7 short, rounded or slightly pointed, semihyaline tubercles, 2–4 μ long; cysts pendent from beneath the head, hyaline, ovoid or globoid, slow to burst in water; pedicel short, hyaline, deciduous.

ON MIMOSACEAE:
Acacia filiculoides (Cav.) Trel. (*A. filicina* Willd.), Guerrero, Morelos.
Type collected at Iguala, State of Guerrero, Mexico, November 3, 1903, *E. W. D. Holway 5312*.
DISTRIBUTION: Southern Mexico.

14. **Ravenelia texensis** Ellis & Gall.; Dietel, Hedwigia **33**: 42. 1894.

Ravenelia texanus Ellis & Gall. Bull. Texas Agr. Exp. Sta. 9: 28, nomen nudum. 1890.

O. Pycnia unknown.

II. Uredinia amphigenous, small, scattered, subcuticular, early naked, pulverulent, cinnamon-brown; paraphyses intermixed with the spores, spatulate or capitate, smooth, 10–14 by 30–50 μ, cinnamon-brown, paler below, wall thicker above, 5–8 μ, stipe solid; urediniospores broadly oval or globoid, 18–20 by 18–24 μ; wall golden-yellow, medium thick, 2–2.5 μ, echinulate-verrucose, pores 6–10, scattered.

III. Telia amphigenous, small, scattered, subcuticular, blackish, shining; paraphyses none; teliospore-heads chestnut-brown, 5–6 cells across, 50–75 μ in diameter, smooth or with 2–4 very inconspicuous papillae on each cell; cysts pendent, 6–8, appressed to the underside of the head, slightly united with one another.

ON MIMOSACEAE:
(?) *Acuan Jamesii* (T. & G.) Kuntze (*Desmanthus Jamesii* T. & G.), Texas.
TYPE LOCALITY: College Station, Texas, on *Desmanthus* (?).
DISTRIBUTION: Central Texas.
ILLUSTRATIONS: Hedwigia **33**: *pl. 3, f. 13*; Bot. Gaz. **35**: *pl. 2, f. 1*.

15. **Ravenelia mimosicola** Arthur, sp. nov.

O. Pycnia unknown.

II. Uredinia amphigenous, numerous, scattered or in circinating groups, round, small, 0.3–0.8 mm. across, subcuticular, early naked, cinnamon-brown, ruptured cuticle noticeable; paraphyses abundantly intermixed with the spores, capitate or clavate-capitate, small, 8–12 by 40–55 μ, smooth, wall of head thick, thicker above and cinnamon-brown, paler below, stipe solid and colorless; urediniospores broadly ellipsoid or slightly obovate, small, 13–16 by 18–22 μ; wall pale cinnamon-brown, thin, about 1 μ, closely and finely echinulate-verrucose, pores 6–10, scattered.

III. Telia amphigenous, numerous, scattered, irregular, 1 mm. or less across, subcuticular, early naked, chocolate-brown, shining, ruptured cuticle noticeable; paraphyses none; teliospore-heads chestnut-brown, 5–7 cells across, 60–80 μ in diameter, each spore bearing 5–7 rather blunt, semihyaline papillae, 1–4 μ long; cysts pendent from pedicel attachment, ovate-oblong, slow to burst in water; pedicel hyaline, short, deciduous.

ON MIMOSACEAE:
Mimosa polyanthoides Rob., Guerrero.
Mimosa stipitata Rob., Guerrero, Morelos.
Type collected at Iguala, State of Guerrero, Mexico, on *Mimosa stipitata*, November 4, 1903, *E. W. D. Holway 5326*.
DISTRIBUTION: Southern Mexico.
ILLUSTRATION: Beih. Bot. Centr. **20**^{2}: *pl. 6, f. 27*.

16. **Ravenelia fragrans** Long, Bot. Gaz. **35**: 123. 1903.

O. Pycnia unknown.

II. Uredinia amphigenous, often forming witches' brooms, thickly covering large areas, or later scattered, round, 0.3–0.5 mm. across, often confluent, subcuticular, early naked, cinnamon-brown, ruptured cuticle scarcely noticeable; paraphyses abundantly intermixed with the spores, mostly cylindrical, or somewhat clavate, 7–12 by 32–50 μ, wall thickened and pale cinnamon-brown above, nearly colorless below, peripheral ones thinner-walled and more spatulate; urediniospores ellipsoid or globoid, small, 13–15 by 18–23 μ; wall pale cinnamon-brown, uniformly thin, 1.5–2 μ, closely and minutely echinulate, pores 8 or more, scattered.

III. Telia amphigenous, scattered, irregular, small, less than 1 mm. across, subcuticular, soon naked, blackish-brown, shining, ruptured cuticle noticeable; paraphyses none; teliospore-heads chestnut-brown, 5–7 cells across, 65–85 μ in diameter, each spore bearing

3–4 short, blunt, semihyaline papillae, marginal tubercles about 2 to each cell, nearly colorless, cylindrical or somewhat capitate, 5–7 μ long, 3–4 μ wide; cysts pendent beneath the head, ovate-oblong, hyaline; pedicel hyaline, short, deciduous.

ON MIMOSACEAE:
Mimosa fragrans A. Gray, Texas.
TYPE LOCALITY: Austin, Texas, on *Mimosa fragrans*.
DISTRIBUTION: Central Texas.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 2, f. 14.*

17. **Ravenelia Mimosae-caeruleae** Dietel, Beih. Bot. Centr. **20**[2]: 378. 1906.

O. Pycnia unknown.

II. Uredinia amphigenous, in groups, sometimes circinate, 0.3–1 mm. across, subcuticular, early naked, light cinnamon-brown, ruptured cuticle not conspicuous; paraphyses abundant, intermixed with the spores, clavate, 10–14 by 45–72 μ, smooth, thick-walled, 4–6 μ, cinnamon-brown above, paler below, stipe solid; urediniospores globoid or broadly ellipsoid, 17–19 by 19–23 μ; wall cinnamon-brown, uniform, about 1.5 μ thick, moderately echinulate-verrucose, pores 8 or more, scattered.

III. Telia amphigenous, gregarious, 0.3–0.8 mm. across, sometimes confluent, subcuticular, early naked, blackish-brown, shining, ruptured cuticle noticeable; teliospore-heads chestnut-brown, 4–6 cells across, 65–80 μ in diameter, each spore bearing about 5 or 6 straight tubercles, 3–5 μ long, rounded or slightly pointed, nearly colorless; cysts 4–6, hyaline, pendent from the base of the pedicel, slow to burst in water; pedicel short, hyaline, deciduous.

ON MIMOSACEAE:
Mimosa caerulea Rose, Morelos.
TYPE LOCALITY: Cuautla, Mexico, on *Mimosa caerulea*.
DISTRIBUTION: Southern Mexico.
ILLUSTRATION: Beih. Bot. Centr. **20**[2]: *pl. 6, f. 26.*

18. **Ravenelia Mimosae-albidae** Dietel, Beih. Bot. Centr. **20**[2]: 378. 1906.

O. Pycnia unknown.

II. Uredinia amphigenous, numerous, scattered or often in circinating groups, occasionally confluent, round or oblong, 0.4–0.8 mm. across, subcuticular, early naked, pulverulent, cinnamon-brown, ruptured cuticle noticeable; paraphyses intermixed with the spores, numerous, spatulate or clavate-capitate, 10–15 by 40–60 μ, smooth, wall of head thick, 3–5 μ, golden-brown above, stipe solid, hyaline; urediniospores globoid or broadly ellipsoid, 15–20 by 21–26 μ; wall dark cinnamon-brown, 1.5–2.5 μ thick, densely and evenly verrucose, pores 8–10 or more, scattered.

III. Telia amphigenous, numerous, scattered, irregular, small, often confluent, subcuticular, soon naked, blackish-brown, shining, ruptured cuticle not conspicuous; paraphyses wanting or same as in uredinia; teliospore-heads dark chestnut-brown, 4–6 cells across, 60–90 μ in diameter, each spore bearing 5–7 or more semihyaline, rather blunt tubercles, 4–7 μ long, occurring beneath the head as well as above; cysts pendent from base of pedicel, not coherent, ovoid, 6–8, slow to burst in water; pedicel hyaline, short, deciduous.

ON MIMOSACEAE:
Mimosa albida H. & B., Morelos.
Mimosa albida floribunda Rob., Jalisco, Oaxaca.
TYPE LOCALITY: Cuernavaca, Mexico, on *Mimosa albida*.
DISTRIBUTION: Southern Mexico.
ILLUSTRATION: Beih. Bot. Centr. **20**[2]: *pl. 6, f. 25.*

19. **Ravenelia cassiaecola** Atk. Bot. Gaz. **16**: 313. 1891.

O. Pycnia unknown.

II. Uredinia amphigenous, round or oblong, small, 1 mm. or less across, subcuticular, early naked, pulverulent, cinnamon-brown, ruptured cuticle noticeable; paraphyses none; urediniospores ellipsoid or globoid, small, 12–17 by 13–20 μ; wall cinnamon-brown, medium thick, 2–3 μ, finely and closely verrucose, pores 6–8, scattered.

III. Telia amphigenous, round or oblong, 1–2 mm. long, often confluent on the stem, chestnut-brown (on leaves) to blackish-brown (on stems), pulvinate, subcuticular, ruptured cuticle noticeable; paraphyses none; teliospore-heads chestnut-brown, 4–6 cells across, 45–90 μ in diameter, smooth or with an indistinct papilla in center of each cell; cysts globose, 6–15, pendent from the insertion of the pedicel, not united with one another, slow to burst in water; pedicel persistent, slightly tinted, 50–100 μ long.

ON CAESALPINIACEAE:
Chamaecrista aspera (Muhl.) Greene, Florida.
Chamaecrista fasciculata (Michx.) Greene (*Cassia Chamaecrista* L.), Ohio.
Chamaecrista multipinnata (Pollard) Greene, Alabama, Mississippi.
TYPE LOCALITY: Auburn, Alabama, on "*Cassia nictitans*," error for *Chamaecrista multipinnata*.
DISTRIBUTION: Southern Ohio to Florida and Mississippi.
ILLUSTRATIONS: Bot. Gaz. **35**: *pl. 2, f. 12*; Hedwigia **33**: *pl. 5, f. 23*.
EXSICCATI: Seym. & Earle, Econ. Fungi *B 25*.

20. **Ravenelia indica** Berk. Gard. Chron. **1853**: 132. 1853.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered or in circinating groups, round or irregular, 0.3–1 mm. across, subcuticular, soon naked, cinnamon-brown, ruptured cuticle noticeable; paraphyses wanting; urediniospores globoid, 13–16 by 16–20 μ; wall pale golden-brown, medium thick, 2–3 μ, finely echinulate-verrucose, pores 6–10, scattered.

III. Telia amphigenous, chiefly caulicolous, elongated, 0.5–1 mm. wide by 1–3 mm. long, often larger and coalescent, subcuticular, early naked, blackish-brown, somewhat shining, ruptured cuticle conspicuous; teliospore-heads dark chestnut-brown, hemispherical, from above roundish, 6–8 cells across, 70–112 μ, in diameter, smooth; cysts globoid or ovoid, 16–18 by 18–26 μ, hyaline, smooth, pendent from beneath the head, not united; pedicel cinnamon-brown, 10–16 μ in diameter, 40–130 μ long.

ON CAESALPINIACEAE:
Cassia Absus L., Jalisco, Oaxaca.
Cassia hispidula Vahl, Oaxaca.
TYPE LOCALITY: Parus Nath, Behar, India, on "*Acacia* or *Abrus*," errors for *Cassia Absus*.
DISTRIBUTION: Southern Mexico; also in India.

21. **Ravenelia mesilliana** Ellis & Barth. Bull. Torrey Club **25**: 508. 1898.

O. Pycnia unknown.

II. Urediniospores intermixed with the teliospores, few seen, globoid or broadly ellipsoid, 17–20 by 20–23 μ; wall cinnamon-brown, medium thick, 2–2.5 μ, low and sparsely echinulate, pores 6 or more, scattered.

III. Telia amphigenous, numerous, scattered, crowded, often confluent, about 1 mm, across, subcuticular, early naked, blackish-brown, shining, ruptured cuticle noticeable; paraphyses unknown; teliospore-heads chestnut-brown, 5–8 cells across, 50–90 μ in diameter, smooth; cysts hyaline, globoid, pendent beneath entire head, somewhat united; pedicel hyaline, short, deciduous.

ON CAESALPINIACEAE:
Cassia bauhinioides A. Gray, New Mexico.
TYPE LOCALITY: Mesilla, New Mexico, on *Cassia bauhinioides*.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 2, f. 13*.

22. **Ravenelia portoricensis** Arthur, Bull Torrey Club **31**: 5. 1904.

Ravenelia Arthuri Long, Jour. Myc. **12**: 234. 1906.

O. Pycnia unknown.

II. Uredinia amphigenous, in circinating groups, roundish, 0.5 mm. or less across, subepidermal, soon naked, pale brownish-yellow, ruptured epidermis noticeable; paraphyses none; urediniospores broadly ellipsoid, 16–20 by 21–29 μ; wall golden-yellow, medium thick, 2.5 μ, rather thickly echinulate, pores 6–8, scattered.

III. Telia chiefly epiphyllous, scattered, oval or oblong, 0.5–1 mm. long, often confluent, subepidermal, soon naked, blackish-brown, shining, ruptured epidermis very con-

spicuous; teliospore-heads chestnut-brown, 5–8 cells across, 75–110 μ in diameter, smooth; cysts hyaline, globoid, pendent beneath entire head; pedicel short, deciduous.

ON CAESALPINIACEAE:
Cassia emarginata L., Porto Rico.
Cassia sp., Jamaica.
TYPE LOCALITY: Ponce, Porto Rico, on *Cassia emarginata*.
DISTRIBUTION: West Indies.

23. **Ravenelia Longiana** Sydow, Hedwigia Beibl. **40**: 128. 1901.

O. Pycnia unknown.

II. Uredinia amphigenous, or at first hypophyllous, scattered, subcuticular, soon naked, pulverulent, cinnamon-brown, ruptured cuticle inconspicuous; paraphyses few, intermixed with the spores, colorless, cylindrical with very thick walls, or occasionally clavate with thinner-walled heads and solid stipes, 10–15 by 30–50 μ; urediniospores ellipsoid or obovate-globoid, 15–25 by 18–30 μ; wall medium thick, 2–2.5 μ, cinnamon-brown, bluntly and rather sparsely echinulate, pores 6–8, scattered.

III. Telia amphigenous, small, scattered, often confluent into large masses, blackish, shining, subcuticular, ruptured cuticle inconspicuous; paraphyses none; teliospore-heads chocolate-brown, 6–8 cells across, 75–100 μ in diameter, smooth; cysts globoid, 8–10, pendent from the base of the pedicel, slow to burst in water; pedicel colorless, short, deciduous.

ON CAESALPINIACEAE:
Cassia Roemeriana Scheele, Texas.
TYPE LOCALITY: Austin, Texas, on *Cassia Roemeriana*.
DISTRIBUTION: Texas.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 2, f. 2.*
EXSICCATI: Sydow, Ured. *1736.*

24. **Ravenelia spinulosa** Dietel & Holway, Bot. Gaz. **31**: 336. 1901.

O. Pycnia unknown.

II. Uredinia amphigenous, numerous, round or irregular, 0.5–1 mm. across, often gregarious and confluent, subcuticular, rather tardily naked, cinnamon-brown, ruptured cuticle conspicuous; paraphyses intermixed with the spores, clavate-capitate or some cylindrical, 10–15 by 30–50 μ, colorless, wall of head thin, stipe usually solid, smooth; urediniospores broadly ellipsoid, 14–18 by 18–24 μ; wall cinnamon-brown, 1.5–2 μ thick, low and sparsely echinulate, pores 8–10, scattered.

III. Telia amphigenous, numerous, scattered, round or irregular, 0.5–1 mm. across, often confluent, subcuticular, soon naked, blackish-brown, shining, ruptured cuticle conspicuous; teliospore-heads chestnut-brown, 7–9 cells across, 70–120 μ in diameter, each spore with a long, semihyaline blunt tubercle, 5–8 μ long, 3–4 μ wide at base; cysts hyaline, globoid, pendent beneath entire head; pedicel short, deciduous.

ON CAESALPINIACEAE:
Cassia Galeottiana Martens, Puebla.
Cassia Holwayana Rose (*C. multiflora* Mart. & Gal.), Morelos, Oaxaca.
TYPE LOCALITY: Oaxaca, Mexico, on *Cassia multiflora*.
DISTRIBUTION: Mexico.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 2, f. 15.*

25. **Ravenelia papillifera** Sydow, Ann. Myc. **1**: 330. 1903.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered, round or irregular, 0.5–1 mm. across, subcuticular, soon naked, pulverulent, cinnamon-brown, ruptured cuticle noticeable; paraphyses few, intermixed with the spores, clavate or clavate-capitate, 8–15 by 25–40 μ; wall colorless, thin, smooth; urediniospores broadly ellipsoid, 15–21 by 20–30 μ; wall cinnamon-brown, 2–2.5 μ thick, low and sparsely echinulate, pores 6–10, scattered.

III. Telia amphigenous, few, scattered, round or oblong, about 0.5 mm. across, subcuticular, early naked, chocolate-brown, shining, ruptured cuticle noticeable; teliospore-heads chestnut-brown, 5–7 cells across, 75–110 μ in diameter, each spore set with a single, wart-like, semihyaline papilla, 1–3 μ long; cysts hyaline, numerous, pendent beneath entire head; pedicel short, hyaline, deciduous.

ON CAESALPINIACEAE:
Cassia angustisiliqua Lam., New Providence.
Cassia Lindheimeriana Scheele, Texas.
TYPE LOCALITY: Austin, Texas, on *Cassia Lindheimeriana*.
DISTRIBUTION: Texas; Bahamas.
EXSICCATI: Sydow, Ured. *1737*.

26. **Ravenelia inconspicua** Arth. Bot. Gaz. **39**: 395. 1905.

O. Pycnia unknown.

II. Uredinia hypophyllous, round, small, 0.5 mm. or less across, subcuticular, soon naked, pulverulent, cinnamon-brown, ruptured cuticle inconspicuous; paraphyses abundantly intermixed with the spores, clavate or somewhat spatulate, smooth, cinnamon-brown, paler below, walls thick, 3–6 μ, stipe solid; urediniospores globose or broadly elliptical, 15–20 by 15–22 μ; wall medium thick, 2–2.5 μ, golden-yellow, closely verrucose, pores about 10, scattered.

III. Telia hypophyllous, very small, scattered, blackish, shining, subcuticular, ruptured cuticle inconspicuous; paraphyses none; teliospore-heads chestnut-brown, 6–8 cells across, 60–100 μ in diameter, each cell bearing 4–6 cylindrical tubercles, 3 μ wide by 5–7 μ long, slightly colored; cysts pendent, appressed to the underside of the head, 6–10, slightly united with one another.

ON CAESALPINIACEAE:
Caesalpinia or *Cassia* sp., Jalisco.
TYPE LOCALITY: Zapotlan, Jalisco, Mexico, on *Cassia* (or *Caesalpinia*) sp.
DISTRIBUTION: Known only from the type locality.

27. **Ravenelia Humphreyana** P. Henn. Hedwigia **37**: 278. 1898.

Ravenelia pulcherrima Arth. Bot. Gaz. **39**: 395. 1905.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered, round, 0.5 mm. or less across, subcuticular, early naked, light cinnamon-brown, ruptured cuticle noticeable; paraphyses numerous, intermixed with the spores, capitate or clavate-capitate, 10–15 by 30–55 μ, wall much thickened above, up to 15 μ, thin below, 1–2 μ, heads chestnut-brown, stipe hyaline; urediniospores globoid, 13–18 by 15–20 μ; wall cinnamon-brown, thin, about 1 μ, finely echinulate-verrucose, pores 6–8, scattered.

III. Telia amphigenous, small, scattered, or confluent, subcuticular, soon naked, chocolate-brown, ruptured cuticle noticeable; paraphyses lacking; teliospore-heads chestnut-brown, 5–7 cells across, 60–120 μ in diameter, appearing smooth, but each spore set with 3–5 inconspicuous wart-like papillae; cysts hyaline, ovoid, appressed, extending from pedicel to periphery; pedicel short, deciduous.

ON CAESALPINIACEAE:
Poinciana pulcherrima L. (*Caesalpinia pulcherrima* Sw.), Guerrero, Morelos; Guatemala; Cuba; Jamaica.
TYPE LOCALITY: Kingston, Jamaica, on "*Cassia* sp.", error for *Poinciana pulcherrima*.
DISTRIBUTION: West Indies, Mexico and Central America.

28. **Ravenelia Caesalpiniae** Arth. Bull. Torrey Club **31**: 5. 1904.

O. Pycnia chiefly epiphyllous, arising beneath the cuticle, crowded in small groups, depressed, 15–18 μ high by 60–100 μ broad, golden-yellow, becoming brownish.

II. Uredinia chiefly hypophyllous, arising beneath the cuticle, at first in small groups circinating about the pycnia, finally irregularly scattered, roundish or oblong, at first yellowish, afterward ochraceous, ruptured cuticle noticeable; paraphyses of the periphery clavate, nearly colorless, wall uniformly thin, 1–1.5 μ, paraphyses intermixed with the spores numerous, capitate, slightly tinted above, head globose with very thick wall, pedicel solid; urediniospores obovate to obovate-cuneate, 16–23 by 28–35 μ; wall thin, 1.5–2 μ, sometimes slightly thicker above, 1.5–3 μ, chestnut-brown, often paler and almost hyaline below, nearly or entirely smooth above, prominently and evenly echinulate below, pores 4, superequatorial.

III. Teliospores unknown.

ON CAESALPINIACEAE:
Caesalpinia sp., Porto Rico.
TYPE LOCALITY: Near Bayamon, Porto Rico, on *Caesalpinia* sp.
DISTRIBUTION: Known only from the type locality.

29. **Ravenelia Talpa** (Long) Arth. Bot. Gaz. **39**: 396. 1905.

Pleoravenelia Talpa Long, Bot. Gaz. **35**: 130. 1903.

O. Pycnia unknown.

II. Uredinia chiefly epiphyllous, scattered, round, small, subepidermal, soon naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; paraphyses none; urediniospores broadly ellipsoid or somewhat obovate, 16–22 by 21–27 μ; wall cinnamon-brown, 1–1.5 μ thick, slightly thicker above, 1.5–2.5 μ, moderately echinulate-verrucose, pores about 6, approximately equatorial.

III. Telia amphigenous, scattered, irregular, small, subepidermal, soon naked, blackish, shining, ruptured epidermis noticeable; teliospore-heads chocolate-brown, 4-8 cells across, 55–95 μ in diameter, each spore bearing 3–5 inconspicuous, semihyaline, wart-like papillae; cysts hyaline, large, pendent and decurrent into pedicel, swelling in water; pedicel hyaline, short, deciduous.

ON FABACEAE:
Cracca Talpa (S. Wats.) Rose (*Tephrosia Talpa* S. Wats.), Jalisco, Oaxaca.
TYPE LOCALITY: Oaxaca, Mexico, on *Tephrosia Talpa*.
DISTRIBUTION: Southern Mexico.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 3, f. 22.*

30. **Ravenelia epiphylla** (Schw.) Dietel, Hedwigia **33**: 27. 1894.

Sphaeria epiphylla Schw. Schr. Nat. Ges. Leipzig **1**: 40. 1822.
Ravenelia glandulosa B. & C. Gard. Chron. **1853**: 132. 1853.
Ravenelia glandulaeformis B. & C. Grevillea **3**: 56. 1874.
Pleoravenelia epiphylla Long, Bot. Gaz. **35**: 128. 1903.

O. Pycnia epiphyllous, punctiform, crowded in small groups, subepidermal, conical-globoid, 90–120 μ wide and about the same height; ostiolar filaments 20–40 μ long.

II. Uredinia amphigenous, small, crowded in circular groups on yellow spots, subepidermal, soon naked, pulverulent, ferruginous, ruptured epidermis conspicuous; paraphyses none; urediniospores obovate or obovate-globoid, 19–26 by 28–35 μ; wall golden-brown, medium thick, 2.5–3 μ, closely verrucose, pores 6, equatorial.

III. Telia amphigenous, small, scattered or coalescing, blackish, shining, subepidermal; teliospore-heads chestnut-brown, variable in size, 4–7 cells across, 80–115 μ in diameter, smooth; cysts colorless, decurrent on the pedicel; pedicel very short, colorless.

ON FABACEAE:
Cracca hispidula (Michx.) Kuntze (*Tephrosia hispidula* Pers.), Alabama, New York, South Carolina.
Cracca spicata (Walt.) Kuntze (*Tephrosia spicata* T. & G.), Alabama, Florida, South Carolina.
Cracca virginiana L. (*Tephrosia virginiana* Pers., *Galega virginiana* L.), Alabama, Connecticut, Delaware, Florida, Georgia, Illinois, Michigan, Missouri, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, West Virginia, Wisconsin.
TYPE LOCALITY: North Carolina, on *Galega virginiana*.
DISTRIBUTION: New York to southern Michigan and Missouri and southward to the Gulf of Mexico.
ILLUSTRATIONS: Hedwigia **33**: *pl. 1, f. 1;* Bot. Gaz. **35**: *pl. 3, f. 18;* Beih. Bot. Centr. **20**^{2}: *pl. 5, f. 7, 8.*
EXSICCATI: Ellis. N. Am. Fungi *363;* Ellis & Ev. Fungi Columb. *268;* Thüm. Myc. Univ. *1251;* Seym. & Earle, Econ. Fungi *B 26;* Rav. Fungi Car. Exs. **3**: *72;* Roumeguère, Fungi Sel. Exs. *4832;* Rab.-Wint. Fungi Eur. *2816.*

31. **Ravenelia irregularis** Arthur, sp. nov.

O. Pycnia epiphyllous, in small groups, inconspicuous, light-yellow, punctiform, subepidermal, rounded-conical, 60-90 μ broad by half as high.

II. Uredinia hypophyllous at first on discolored spots, then amphigenous and scattered, round, small, subepidermal, soon naked, pulverulent, light cinnamon-brown, ruptured epidermis noticeable; paraphyses none; urediniospores broadly ellipsoid, 17–19 by 21–23 μ;

wall pale-yellow, uniformly thin, about 1 μ, rather closely echinulate-verrucose, pores 6 or more, scattered.

III. Telia chiefly epiphyllous, scattered, small, subepidermal, blackish-brown, shining, ruptured epidermis not conspicuous; teliospore-heads dark chestnut-brown, very irregular in outline, 4–7 cells across, 60–90 μ in diameter, each spore bearing 3–5 irregularly angular, semihyaline tubercles, 4–7 μ long, with nearly as great a diameter; cysts hyaline, somewhat appressed, decurrent into the pedicel; pedicel hyaline, short, deciduous.

ON FABACEAE:
Cracca macrantha (T. & G.) Rose (*Tephrosia macrantha* S. Wats.), Jalisco.
Type collected at Etzatlan, Jalisco, Mexico, on *Cracca macrantha*, October 2, 1903, *E. W. D. Holway 5100*.

32. **Ravenelia caulicola** Arthur, sp. nov.

O. Pycnia unknown.

II. Uredinia chiefly caulicolous, scattered, small, 0.2–0.3 mm. across, sometimes confluent, subepidermal, soon naked, dark cinnamon-brown, ruptured epidermis conspicuous; paraphyses wanting; urediniospores broadly ellipsoid, 16–18 by 19–25 μ; wall pale-yellow, uniformly thin, 1–1.5 μ, lowly and rather sparsely echinulate, pores 6–10, scattered.

III. Telia chiefly caulicolous, numerous, scattered, often crowded and confluent, subepidermal, soon naked, blackish, shining, ruptured epidermis noticeable; teliospore-heads light chocolate-brown, 4–8 cells across, 90–120 μ in diameter, smooth; cysts hyaline, large, pendent and decurrent into the pedicel, swelling and bursting in water; pedicel hyaline, persistent, 45–90 μ long.

ON FABACEAE:
Cracca cinerea (L.) Morong, Bahamas.
Type collected at Cave Cay, Exuma Chain, Bahama Islands, February 19, 1905, *N. L. Britton & C. F. Millspaugh 2807*.

33. **Ravenelia Brongniartiae** Dietel & Holway, Bot. Gaz. **24**: 35. 1897.

Pleoravenelia Brongniartiae Long, Bot. Gaz. **35**: 130. 1903.

O. Pycnia epiphyllous, crowded in small groups, punctiform, brownish-yellow, subcuticular, flattened-conical, 75–130 μ broad, 30–50 μ high.

II. Uredinia at first hypophyllous, becoming amphigenous and scattered, roundish or oblong, subepidermal, soon naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; paraphyses none; urediniospores ellipsoid or obovate-ovoid, 18–24 by 22–30 μ; wall thick, 2–3 μ, light chestnut-brown, closely and strongly echinulate, pores 8–12, scattered.

III. Telia amphigenous, from punctate to 0.5 mm. across, scattered, subepidermal, blackish-brown, shining, ruptured epidermis conspicuous; teliospore-heads chestnut-brown, 4–8 cells across, 75–150 μ in diameter, densely covered with papillae, 3–4 μ high, pale-brown; marginal tubercles one to each cell, cylindrical or somewhat capitate, 3–7 μ wide by 10–14 μ long, chestnut-brown; cysts pendent, decurrent into the pedicel; pedicel colorless, short, deciduous.

ON FABACEAE:
Brongniartia foliosa Benth., San Luis Potosi.
Brongniartia intermedia Moric., Mexico (state), Morelos.
Brongniartia podalyrioides H. B. K., Guerrero, Morelos.
Brongniartia sericea Schlecht., Oaxaca.
TYPE LOCALITY: Cuernavaca, Mexico, on *Brongniartia* sp.
DISTRIBUTION: Central and southern Mexico.
ILLUSTRATIONS: Bot. Gaz. **35**: *pl. 3, f. 20*; Beih. Bot. Centr. **20**^{2}: *pl. 5, f. 9*.
EXSICCATI: Sydow, Ured. *1991*.

34. **Ravenelia similis** (Long) Arth. Bot. Gaz. **39**: 396. 1905.

Pleoravenelia similis Long, Bot. Gaz. **35**: 128. 1903.

O. Pycnia epiphyllous, crowded in small groups, punctiform, brownish-yellow, subcuticular, flat or flattened-conical, 65–100 μ broad, 20–30 μ high.

II. Uredinia at first hypophyllous and grouped on discolored spots, becoming amphigenous and scattered, small, roundish, subepidermal, soon naked, pulverulent, dark cinnamon-brown, ruptured epidermis noticeable; paraphyses none; urediniospores ellipsoid or

obovate-ovoid, 17–26 by 20–30 μ; wall thick, 2–3 μ, chestnut-brown, closely and strongly echinulate, pores 8–12, scattered in or near the equatorial zone.

III. Telia amphigenous, from punctate to 0.5 mm. across, scattered, subepidermal, blackish-brown, shining; teliospore-heads chestnut-brown, 6–8 cells across, 65–150 μ in diameter, smooth; cysts pendent, decurrent into the pedicel; pedicel colorless, short.

ON FABACEAE:
Brongniartia nudiflora S. Wats., Jalisco.
Brongniartia podalyrioides H. B. K., Jalisco.
TYPE LOCALITY: Guadalajara, Mexico, on *Brongniartia* sp.
DISTRIBUTION: Southern Mexico.
ILLUSTRATIONS: Bot. Gaz. **35**: *pl. 3, f. 21;* Beih. Bot. Centr. **20**^{2}: *pl. 5, f. 10.*

35. **Ravenelia Piscidiae** Long, Jour. Myc. **12**: 234. 1906.

O. Pycnia unknown.

II. Uredinia amphigenous, small, 1 mm. or less across, subepidermal, pulverulent, pale cinnamon-brown, ruptured epidermis inconspicuous; paraphyses few, intermixed with the spores, cylindrical, sometimes curved above, 10–12 by 30–50 μ, wall smooth, uniformly thin, chestnut-brown above, paler below; urediniospores ellipsoid, 15–17 by 17–29 μ; wall pale cinnamon-brown, thin, 1–1.5 μ, finely and closely echinulate, pores 7–10, scattered.

III. Telia amphigenous, minute, scattered and coalescing, blackish, subepidermal, ruptured epidermis inconspicuous; paraphyses few or none; teliospore-heads dark chestnut-brown, 4–6 cells across, 75–120 μ in diameter, smooth; cysts flattened against the underside of the head, reaching from the pedicel to the periphery; pedicel colorless, short, slender.

ON FABACEAE:
Ichthyomethia Piscipula (L.) A. S. Hitchc. (*Piscidia Erythrina* L.), Florida.
TYPE LOCALITY: Miami, Florida, on *Piscidia Erythrina*.
DISTRIBUTION: Known only from the type locality.

36. **Ravenelia laevis** Dietel & Holway, Bot. Gaz. **24**: 35. 1897.

Pleoravenelia laevis Long, Bot. Gaz. **35**: 127. 1903.

O. Pycnia unknown.

II. Uredinia amphigenous, small, 1 mm. or less across, subepidermal, pulverulent, cinnamon-brown, ruptured epidermis evident; paraphyses evenly intermixed with the spores, spatulate or spatulate-capitate, 20–30 by 80–110 μ, wall smooth, uniformly thick, 7–10 μ, chestnut-brown above, paler below; urediniospores broadly obovate or globoid, 16–22 by 20–26 μ; wall cinnamon-brown, medium thick, about 3 μ, finely and closely echinulate, pores many (15 or more), scattered.

III. Telia epiphyllous, grouped or scattered, punctate to 1 mm. in diameter, blackish, shining, subepidermal, ruptured epidermis noticeable; paraphyses few or none; teliospore-heads chestnut-brown, 5–6 cells across, 60–130 μ in diameter, smooth; cysts flattened against the underside of the head, reaching from the pedicel to the periphery; pedicel colorless, short, slender.

ON FABACEAE:
Indigofera densiflora Mart. & Gal., Mexico (state), Morelos, Oaxaca.
Indigofera jaliscensis Rose, Jalisco.
TYPE LOCALITY: Eslava, near City of Mexico, Mexico, on *Indigofera* sp.
DISTRIBUTION: Southern Mexico.
ILLUSTRATIONS: Bot. Gaz. **35**: *pl. 3, f. 17;* Beih. Bot. Centr. **20**^{2}: *pl. 6, f. 11.*

37. **Ravenelia Indigoferae** Tranz. Hedwigia **33**: 369. 1894.

Uredo Anilis P. Henn. Hedwigia Beibl. **38**: 68. 1899.
Pleoravenelia Indigoferae Long, Bot. Gaz. **35**: 129. 1903.

O. Pycnia unknown.

II. Uredinia amphigenous, small, 1 mm. or less across, subepidermal, more or less grouped, pulverulent, cinnamon-brown, ruptured epidermis inconspicuous; paraphyses evenly intermixed with the spores, spatulate or spatulate-capitate, 20–30 by 80–100 μ, cinnamon-brown with nearly colorless stipe, wall smooth, thickened above, 2–3 μ, thin below; urediniospores obovate-oval or ovoid, 18–23 by 22–27 μ; wall cinnamon-brown, medium thin, 1.5–2 μ, finely and sparsely echinulate, pores 8–12, scattered.

III. Telia amphigenous and caulicolous, at first arising in a circle about the uredinia, small, coalescing into large areas, on the stem forming fusiform swellings several centimeters long, subepidermal, chocolate-brown or blackish, shining, ruptured epidermis inconspicuous; paraphyses few or none; teliospore-heads chestnut-brown, 4–6 cells across, 70–120 μ in diameter, each spore bearing 4–8 prominent tubercles, 3 by 4–7 μ, straight, pale-brown; cysts large, delicate, reaching from the pedicel to the periphery; pedicel colorless, slender, short, deciduous.

ON FABACEAE:
Indigofera Anil L., Cuba; Jamaica; Bermuda.
Indigofera Conzattii Rose, Oaxaca.
Indigofera cuernavacana Rose, Morelos.
Indigofera Palmeri S. Wats., Jalisco.
TYPE LOCALITY: Near Guadalajara, Mexico, on "*Indigofera Palmeri*," error for *I. Conzattii*.
DISTRIBUTION: West Indies and southern Mexico; also in South America.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 3, f. 19*.

38. **Ravenelia appendiculata** Lagerh. & Dietel; Dietel, Hedwigia **33**: 47. 1894.

O. Pycnia unknown.

II. Uredinia hypophyllous, small, round, subepidermal, soon naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; paraphyses numerous, intermixed with the spores, clavate, smooth, cinnamon-brown above, very pale below, 12–18 by 30–75 μ, longest ones at side of sorus, walls thin below, 1 μ, very thick at apex, 15–25 μ; urediniospores ellipsoid, 15–19 by 24–30 μ; wall pale-yellow, often nearly colorless, thin, 1–1.5 μ, evenly and sparsely verrucose, pores 4, equatorial.

III. Telia hypophyllous, small, round, subepidermal, blackish, shining; teliospore-heads irregular, chestnut-brown, 4–6 cells across, 50–110 μ in diameter, each spore bearing an upright, cylindrical projection, pale-fulvous, 3–5 μ thick, 10–15 μ long, with a flattened branched apex; cysts few, beneath the head and decurrent into the pedicel, united laterally; pedicel colorless, 30–60 μ long, deciduous.

ON EUPHORBIACEAE:
Phyllanthus Galeottianus Baill., Jalisco, Morelos.
TYPE LOCALITY: Puente de Chimbo, Ecuador, on *Phyllanthus* sp.
DISTRIBUTION: Southern Mexico; also in South America.
ILLUSTRATIONS: Hedwigia **33**: *pl. 4, f. 18*; Bot. Gaz. **35**: *pl. 2, f. 8*; Beih. Bot. Centr. **20**^{2}: *pl. 6, f. 22*.

4. **DENDROECIA** Arth. Résult. Sci. Congr. Bot. Vienne 340. 1906.

Cycle of development includes pycnia and telia, both either subcuticular or subepidermal.

Pycnia depressed-conical.

Telia erumpent, definite. Teliospores fascicled on compound stalks, forming heads bordered with hyaline cysts, each spore one- or two-celled; wall colored, smooth or verrucose.

Type species, *Ravenelia Farlowiana* Dietel (on *Acacia anisophylla*).

Paraphyses absent.	
Teliospore-heads black; cysts pendent.	1. *D. opaca*.
Teliospore-heads brown; cysts appressed.	2. *D. Farlowiana*.
Paraphyses present.	
Teliospore-heads smooth.	3. *D. Lysilomae*.
Teliospore-heads tuberculate.	4. *D. verrucosa*.

1. **Dendroecia opaca** (Dietel) Arthur.

Ravenelia opaca Dietel, Hedwigia **34**: 291. 1895.

O. Pycnia amphigenous, few, crowded in small orbicular groups, chestnut-brown, papilliform, subcuticular, conoidal, much flattened, 160–300 μ broad, 40–60 μ high.

III. Telia chiefly epiphyllous, scattered irregularly, angular, large, 1–2 mm. across, subepidermal, soon naked, black, shining, ruptured epidermis rather conspicuous; teliospore-

heads black, opaque, 5–7 cells across, 80–125 μ in diameter, smooth; cysts globoid, hyaline, pendent from beneath the head, not united; pedicel short, hyaline, deciduous.

ON CAESALPINIACEAE:
Gleditsia triacanthos L., Illinois.
TYPE LOCALITY: Clear Creek, Union County, Illinois, on *Gleditsia triacanthos*.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATIONS: Bot. Gaz. **35**: *pl. 2, f. 5*; Beih. Bot. Centr. **20**[2]: *pl. 6, f. 30*.
EXSICCATI: Seym. & Earle, Econ. Fungi *203*.

2. **Dendroecia Farlowiana** (Dietel) Arth. Résult. Sci. Congr. Bot. Vienne 340. 1906.

Ravenelia Farlowiana Dietel, Hedwigia **33**: 369. 1894.
Ravenelia Acaciae-micranthae Dietel, Beih. Bot. Centr. **20**[2]: 371. 1906.

O. Pycnia amphigenous, numerous, in crowded groups 0.5–1 mm. across, surrounded by telia, noticeable, subcuticular, chestnut-brown, depressed-hemispherical, 65–150 μ in diameter, 25–40 μ high.

III. Telia chiefly epiphyllous, sparingly amphigenous, numerous, gregarious, often crowded about groups of pycnia, early naked, blackish-brown, shining, ruptured cuticle noticeable; teliospore-heads chestnut-brown, 5–8 cells across, 75–100 μ in diameter, nearly or quite smooth; cysts 12–20, hyaline, coherent, bases appressed beneath head, bursting in water, extending to periphery; pedicel short, hyaline, deciduous.

ON MIMOSACEAE:
Acacia anisophylla S. Wats., Coahuila.
Acacia crassifolia A. Gray, Coahuila.
Acacia micrantha Benth., San Luis Potosi.
TYPE LOCALITY: [Jimulco] Mexico, on *Acacia anisophylla*.
DISTRIBUTION: Mexico.
ILLUSTRATION: Bot. Gaz. **35**: *pl. 2, f. 6*.

3. **Dendroecia Lysilomae** Arth. Résult. Sci. Congr. Bot. Vienne 340. 1906.

Ravenelia Lysilomae Arth. Bot. Gaz. **39**: 392. 1905.

O. Pycnia epiphyllous, crowded in small groups, punctiform, rather large, pale brownish-yellow, subcuticular, flattened hemispherical, 80–130 μ wide, 20–30 μ high.

III. Telia epiphyllous, on pale spots, becoming amphigenous, small, 0.25–0.5 mm. across, roundish, chestnut-brown, subepidermal, ruptured epidermis inconspicuous; paraphyses numerous, intermixed with the spores, inconspicuous, cylindrical, 7–10 by 30–40 μ, light golden-brown, wall thin or rarely thick; teliospore-heads (often with a few obovate urediniospores intermixed) chestnut-brown, 7–9 cells across, 80–120 μ in diameter, smooth; cysts appressed beneath the head, extending from periphery to pedicel, united laterally; pedicel colorless, short, deciduous.

ON MIMOSACEAE:
Lysiloma tergemina Benth., Guerrero.
TYPE LOCALITY: Iguala, Mexico, on *Lysiloma tergemina*.
DISTRIBUTION: Known only from the type locality.

4. **Dendroecia verrucosa** (Cooke & Ellis) Arth. Résult. Sci. Congr. Bot. Vienne 340. 1906.

Ravenelia verrucosa Cooke & Ellis, Grevillea **15**: 112. 1887.

O. Pycnia epiphyllous, numerous in circular groups, punctiform, golden-brown, subcuticular, flattened-conical, 80–130 μ wide, 25–45 μ high.

III. Telia amphigenous, small, scattered, coalescing, subepidermal, pulverulent, dull-black, ruptured epidermis inconspicuous; paraphyses mostly encircling the sorus, cylindrical, somewhat contorted, 9–12 by 30–60 μ, walls smooth, more or less thickened, especially above, upper half pale chestnut-brown, paler below; teliospore-heads (often with a few globoid many-pored urediniospores intermixed) chocolate-brown, opaque, 4–8 cells across, 75–100 μ in diameter, each spore bearing 5–8 small tubercles, 2–3 μ high, pale-brown; cysts

flattened on the underside of the head, reaching from the periphery to the pedicel, united laterally; pedicel colorless, short, deciduous.

ON MIMOSACEAE:
Leucaena lanceolata S. Wats., Mexico.
TYPE LOCALITY: Mexico, on "*Lecania*," error for *Leucaena* sp.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATIONS: Hedwigia **33**: *pl. 3, f. 12*; Bot. Gaz. **35**: *pl. 2, f. 9.*

5. DICHEIRINIA Arthur, gen. nov.

Pycnia and aecia unknown, the latter possibly wanting.

Uredinia encircled by paraphyses, subepidermal. Urediniospores borne singly on pedicels, echinulate.

Telia subepidermal. Teliospores free, more than one on each pedicel, 1-celled; pore one, terminal.

Type species, *Triphragmium binatum* Berk. (on unknown plant).

1. Dicheirinia binata (Berk.) Arthur.

Triphragmium binatum Berk. Proc. Am. Acad. **4**: 125. 1858.

O and I. Pycnia and aecia unknown or wanting.

II. Uredinia hypophyllous, subepidermal, scattered, minute, round, 0.1–0.2 mm. across, soon naked, pulverulent, pale cinnamon-brown, ruptured epidermis inconspicuous; paraphyses abundant, peripheral, clavate or capitate, 13–23 μ broad above, about 50 μ long, wall smooth, thin, colorless; urediniospores broadly obovate or globoid, 19–26 by 25–29 μ, wall golden-yellow, thick, 3–4 μ, sparsely and sharply echinulate, pores 3 (?), equatorial.

III. Telia hypophyllous, like the uredinia, but slightly darker-colored; teliospores paired, one slightly higher on pedicel than the other, broadly obovate, 26–29 by 35–40 μ, flattened or rounded above, narrowed toward base; wall cinnamon-brown, medium thick, at sides 2–3 μ, covered above with finger-like projections, more or less branched, up to 12 μ long; pedicel slender, persistent, slightly colored, as long as the spore.

ON unknown plant [MIMOSACEAE?].
TYPE LOCALITY: Nicaragua, on unknown plant.
DISTRIBUTION: Known only from the type locality.

6. PILEOLARIA Cast. Obs. **1**: 22. 1842.

Cycle of development includes pycnia, uredinia and telia, with more or less evident alternating phases. Pycnia subcuticular, other sori subepidermal.

Pycnia depressed-conical or hemispherical; hymenium flat; ostiolar filaments wanting.

Uredinia erumpent, definite, without peridium or paraphyses. Urediniospores borne singly on pedicels, oblong-fusiform; wall colored, usually paler below, verrucose; pores more or less equatorial.

Telia erumpent, definite. Teliospores borne singly on pedicels, one-celled, flattened above and below; wall colored, verrucose.

Type species, *Pileolaria Terebinthi* Cast. (on *Pistacia Terebinthus*).

Urediniospores with wall thickened above.
- Urediniospores with tubercles in evident spiral rows. 1. *P. Toxicodendri.*
- Urediniospores with tubercles in evident longitudinal rows, not crowded. 2. *P. extensa.*
- Urediniospores with tubercles in obscure longitudinal rows, crowded. 3. *P. patzcuarensis.*

Urediniospores with wall not thickened above, tubercles in longitudinal rows. 4. *P. mexicana.*

1. Pileolaria Toxicodendri (Berk. & Rav.) Arthur.

Uromyces Toxicodendri Berk. & Rav. Grevillea **3**: 56. 1874.
Pileolaria brevipes Berk. & Rav. Grevillea **3**: 58. 1874.
Uromyces punctato-striatum Cooke & Hark. Grevillea **14**: 8. 1885.
Uromyces brevipes Holway, Bot. Gaz. **24**: 24. 1897.

O. Pycnia amphigenous, greater number epiphyllous, in rather large groups, crowded, large, papillose, honey-yellow becoming blackish, subcuticular, flattened-hemispherical, 60–110 μ broad, 30–60 μ high.

II. Uredinia chiefly hypophyllous and caulicolous, small, 0.3–0.8 mm. across, round, scattered, or confluent into large groups, especially on ribs and petioles, soon naked, cinnamon-brown, copiously pulverulent, ruptured epidermis inconspicuous; urediniospores fusiform-ellipsoid, sometimes nearly oblong, 21–27 by 32–45 μ, acute or obtuse and somewhat semihyaline at both ends; wall golden-brown, with distinct spiral rows of tubercles, sometimes anastomosing, thick, 4 μ, somewhat thicker above, 5–7 μ, pores 2, near the base, large, indistinct.

III. Telia chiefly epiphyllous, 0.3–0.8 mm. across, round, scattered, or somewhat gregarious and confluent, soon naked, chocolate-brown, ruptured epidermis inconspicuous; teliospores at first globose, soon strongly depressed at top and bottom, mature spores 26–32 μ broad by 21–27 μ long; wall dark chocolate-brown, closely verrucose with low tubercles, thick, 4–5 μ, slightly thicker at apex, often with a hyaline umbo; pedicel colorless, firm, 5 μ thick, 50–75 μ long.

ON SPONDIACEAE:
Rhus diversiloba T. & G., California, Colorado.
Rhus floridana Mearns, Mississippi.
Rhus radicans L., Alabama, Colorado, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Massachusetts, Minnesota, Mississippi, Montana, Nebraska, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, South Carolina, Texas, Vermont, West Virginia, Wisconsin; Ontario; Hidalgo, Michoacan.
Rhus Rydbergii Small, Wyoming.
Rhus Toxicodendron L., South Carolina.
Schmaltzia aromatica (Ait.) Desv. (*Rhus aromatica* Ait), Ontario.
Schmaltzia malacophylla Greene, California.
TYPE LOCALITY: Aiken, South Carolina, on *Rhus Toxicodendron*.
DISTRIBUTION: Throughout North America, especially east of the Rocky Mountains.
EXSICCATI: Rav. Fungi Car. Exs. 3: *94, 97*; Ellis, N. Am. Fungi *247, 248*; Ellis & Ev. Fungi Columb. *176, 1699*; Carleton, Ured. Am. *4*; Kellerm. Ohio Fungi *120*; Griff. West Am. Fungi *283*; Sydow, Ured. *1361, 1408*.

2. **Pileolaria extensa** Arthur, sp. nov.

O. Pycnia amphigenous, thickly scattered over large areas, preceding or among the uredinia, papillose, honey-yellow becoming blackish, subcuticular, flattened-hemispherical, 75–100 μ broad, half as high.

II. Uredinia amphigenous and caulicolous, evenly and thickly effused over young shoots and leaves, causing more or less atrophy, crowded, round, small, 0.25 mm. across, early naked, exceedingly pulverulent, dark cinnamon-brown, ruptured epidermis inconspicuous; urediniospores fusiform-ellipsoid or fusiform-obovate, 16–24 by 28–38 μ, obtuse or sometimes acute at both ends; wall dark golden-brown, often semihyaline both at apex and below, thick, 3–3.5 μ, thicker above 4–7 μ, verrucose with low tubercles, not crowded, having a tendency to be arranged in longitudinal rows, pores small, obscure, probably 3, equatorial.

III. Telia unknown.

ON SPONDIACEAE:
Pistacia mexicana H.B.K. (*Rhus mexicana* A. Gray), Jalisco.
Type collected at Zapotlan, Mexico, May 21, 1893, *C. G. Pringle*.
EXSICCATI: Pringle, Mex. Fungi *3*.

3. **Pileolaria patzcuarensis** (Holway) Arthur.

Uromyces patzcuarensis Holway, Ann. Myc. **2**: 393. 1904.

O. Pycnia epiphyllous, gregarious, in small crowded groups 0.5–1 mm. across, papillose, noticeable, subcuticular, becoming blackish, flattened-hemispherical, 80–120 μ broad, one-third as high.

II. Uredinia amphigenous, irregularly scattered, round, small, 0.1–0.2 mm. across, early naked, pulverulent, light cinnamon-brown, ruptured epidermis not noticeable; urediniospores broadly fusiform-ellipsoid, 23–29 by 30–40 μ, obtuse to acute at both ends; wall golden-brown, somewhat semihyaline both at apex and below, thick, 3–4 μ, thicker above, 5–8 μ, verrucose, with low tubercles thickly set in close, rather evident, longitudinal rows, pores small, 3, equatorial.

III. Telia chiefly epiphyllous, scattered, round, 0.2–0.7 mm. across, early naked, compact, chocolate-brown, ruptured epidermis inconspicuous; teliospores at first globose, soon depressed above and below, becoming disc-shaped, 12–15 μ long, 30–38 μ broad; wall chocolate-brown, thick, 5–6 μ, closely and rather indistinctly verrucose, apex without umbo; pedicel colorless, firm, 5 μ thick, 50–75 μ long, slightly roughened at base.

ON SPONDIACEAE:
Schmaltzia Emoryi Greene, New Mexico.
Schmaltzia schmidelioides (Schlecht.) Greene (*Rhus schmidelioides* Schlecht.), Michoacan.
TYPE LOCALITY: Patzcuaro, Mexico, on *Rhus schmidelioides*.
DISTRIBUTION: Southern border of the United States to southern Mexico.

4. **Pileolaria mexicana** Arthur, sp. nov.

O. Pycnia unknown.

II. Uredinia chiefly hypophyllous, scattered over large areas, often crowded, round, 0.25–0.5 mm. across, early naked, copiously pulverulent, chestnut-brown, ruptured epidermis inconspicuous; urediniospores oval or obovate, 25–30 by 38–52 μ, rounded above, obtuse or narrowed and semihyaline below; wall dark golden-brown, thick, 3–6 μ, verrucose, with prominent and well separated longitudinal rows of tubercles, slightly, or not thickened at apex, pores 3, large, usually somewhat subequatorial, rather indistinct.

III. Telia unknown.

ON SPONDIACEAE:
Styphonia mollis (H.B.K.) Nutt. (*Rhus mollis* H.B.K.), Oaxaca.
Type collected at Oaxaca, Mexico, November 10, 1903, *E. W. D. Holway 5361*.

7. **DISCOSPORA** Arthur, gen. nov.

Cycle of development includes pycnia and telia. Pycnia subcuticular, telia subepidermal.

Pycnia hemispherical or frustum-like; hymenium flat; ostiolar filaments wanting.

Telia erumpent, definite. Teliospores borne singly on pedicels, one-celled, flattened above and below; wall colored, verrucose.

Type species, *Pileolaria effusa* Peck (on *Rhus* sp.).

1. **Discospora effusa** (Peck) Arthur.

Pileolaria effusa Peck, Bot. Gaz. **7**: 55. 1882.
Uromyces effusus De-Toni, in Sacc. Syll. **7**: 576. 1888.

O. Pycnia amphigenous and caulicolous, exceedingly numerous, thickly scattered along the petioles and veins, preceding or among the telia, papillose, conspicuous, subcuticular, becoming blackish-brown, frustum-like, 60–80 μ in diameter, two thirds as high.

III. Telia amphigenous and caulicolous, numerous, thickly scattered over young branches, petioles, and along the veins, roundish, small, 0.25 mm. across, early naked, exceedingly pulverulent, chocolate-brown, ruptured epidermis inconspicuous; teliospores at first globose, soon depressed above and below, becoming disc-shaped, 17–19 μ long, 21–26 μ broad; wall dark cinnamon-brown, medium thin, 2–2.5 μ, thicker at apex, 3–5 μ, with a clear umbo, finely and rather indistinctly verrucose; pedicel colorless, short, one to one and a half times length of spore.

ON SPONDIACEAE:
Rhus sp., Arizona.
TYPE LOCALITY: [Santa Rita Mts.] Arizona, on "*Rhus*, probably *R. aromatica* or *R. triloba*."
DISTRIBUTION: Known only from the type locality.

8. **HEMILEIA** Berk. & Br. Gard. Chron. **1869**: 1157. 1869.

Cycle of development imperfectly known; only uredinia and telia recognized, both subepidermal.

Uredinia formed beneath the stomata, erumpent, without peridium or paraphyses. Urediniospores borne singly on short pedicels, which arise from a protruding hymenium of agglutinated hyphae, obovate, laterally flattened and dorsiventral; wall pale-yellow, smooth on ventral side, papillose on dorsal side, pores obscure or absent.

Telia replacing the uredinia. Teliospores borne singly on pedicels, one-celled, napiform; wall nearly or quite colorless, smooth.

Type species, *Hemileia vastatrix* Berk. & Br. (on *Coffea* sp.).

1. **Hemileia vastatrix** Berk. & Br. Gard. Chron. **1869**: 1157. 1869.

II. Uredinia hypophyllous, thickly scattered, or rarely somewhat circinating, very small, about 0.1 mm. across, light-orange fading to pale-yellow, pulverulent, projecting through stomata and rarely rupturing the epidermis; urediniospores bilateral, slightly obovate, flattened on the ventral side, 20–28 by 30–40 μ; wall pale-yellow, 1–1.5 μ thick, rather thickly and very coarsely papillose on dorsal side with bluntly pointed tubercles 2–4 μ long, 1–1.5 μ in diameter, ventral side smooth, pores obscure.

III. Telia hypophyllous, arising from uredinia, thickly scattered, very small, about 0.1 mm. across, pale-yellow; teliospores napiform or globoid, somewhat umbonate above; wall pale-yellow or seemingly colorless, thin, 1 μ, slightly if any thicker above, smooth; pedicel hyaline, one half to once length of spore, slender.

ON RUBIACEAE:
Coffea arabica L., Costa Rica; Porto Rico.
TYPE LOCALITY: Ceylon, India, on *Coffea* sp.
DISTRIBUTION: Said to have been found in Costa Rica and once in Porto Rico, in the latter instance on imported plants and afterward entirely destroyed; also in eastern Africa, Asia, and the Philippine, Samoan, and other islands of the Pacific.
ILLUSTRATIONS: Gard. Chron. *loc. cit.*; E. & P. Nat. Pfl. 1^{1**}: *f. 35, A–C.*

9. **TRANZSCHELIA** Arth. Résult. Sci. Congr. Bot. Vienne 340. 1906.

Cycle of development includes pycnia, aecia, uredinia and telia, with alternating phases; autoecious or heteroecious. Pycnia subcuticular, other sori subepidermal.

Pycnia depressed-conical or hemispherical; hymenium flat.

Aecia erumpent, cylindrical. Peridium dehiscent at apex, becoming recurved. Aeciospores globoid; wall colored, finely verrucose.

Uredinia erumpent, definite, without peridium. Urediniospores borne singly on pedicels, with paraphyses intermixed, obovoid, somewhat narrowed at both ends; wall colored, usually paler below, echinulate; pores equatorial.

Telia erumpent, definite, pulverulent, without peridium. Teliospores forming heads or balls by being attached by short, fragile pedicels to a common stalk, which is short and inconspicuous, two-celled by transverse septum, cells rounded and easily falling apart; wall colored, verrucose.

Type species, *Puccinia cohaesa* Long (on *Anemone decapetala*).

Autoecious; urediniospores rounded above. 1. *T. cohaesa.*
Heteroecious; urediniospores narrowed above. 2. *T. punctata.*

1. **Tranzschelia cohaesa** (Long) Arth. Résult. Sci. Congr. Bot. Vienne 340. 1906.

Puccinia cohaesa Long, Bull. Torrey Club **29**: 111. 1902.

O. Pycnia chiefly hypophyllous, sparsely scattered over large areas, preceding or accompanying the aecia, conspicuous, hemispherical or conical, honey-yellow becoming chocolate-brown, subcuticular, 130–160 μ broad and half to two thirds as high.

I. Aecia hypophyllous, uniformly and thickly scattered over large areas, short cylindrical, 0.5 mm. across; peridium ample, divided into few (often 4) widely spreading recurved lobes; aeciospores globoid, often angular, 16–21 by 18–23 μ; wall pale golden-yellow, medium thick, 1.5–2 μ, closely and minutely granulose.

II. Uredinia hypophyllous, scattered, round, 0.3–0.8 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis usually noticeable; paraphyses abundant, intermixed with the spores, capitate, or nearly clavate, golden-yellow, 14–18 by 55–75 μ, walls rather thin and slightly thicker above; urediniospores obovate or ellipsoid, 15–22 by 28–38 μ, rounded or obtuse above, somewhat narrowed below; wall golden-yellow, slightly

paler below, thin, 1–2 μ, much thickened above, 5–9 μ, sparsely and sharply echinulate, less so above, pores 3 or 4, equatorial.

III. Telia hypophyllous, scattered, or in circinating or somewhat confluent groups, round, 0.5–1 mm. across, early naked, pulverulent, chocolate-brown, ruptured epidermis usually noticeable; teliospores oblong, 18–22 by 30–45 μ, rounded at both ends, or somewhat narrowed below, greatly constricted and easily falling apart at the septum; wall dark chestnut-brown, thin, 1.5–2 μ, not thickened above, closely and coarsely verrucose; pedicel colorless, short, or rarely nearly as long as the spore, fragile.

ON RANUNCULACEAE:
Anemone decapetala Ard., Texas.
TYPE LOCALITY: Austin, Texas, on "*Anemone caroliniana*," error for *A. decapetala*.
DISTRIBUTION: Central Texas.
ILLUSTRATIONS: Long, *l. c., f. 2*; Holway, N. Am. Ured. **1**: *pl. 2, f. 7*.
EXSICCATI: Ellis & Ev. Fungi Columb. *1643*.

2. **Tranzschelia punctata** (Pers.) Arth. Résult. Sci. Congr. Bot. Vienne 340. 1906.

Aecidium punctatum Pers. Ann. Bot. Usteri **20**: 135. 1796.
Puccinia Pruni-spinosae Pers. Syn. Fung. *226*. 1801.
Puccinia Pruni DC. Fl. Fr. **2**: 222. 1805.
Aecidium quadrifidum DC. in Poir. Encycl. Meth. Bot. **8**: 235. 1808.
Puccinia Prunorum Link, in Willd. Sp. Pl. **6**^{2}: 82. 1825.
Uredo fusiformis Gachet, Act. Soc. Linn. Bordeaux **5**: 232. 1832.
Aecidium hepaticatum Schw. Trans. Am. Phil. Soc. II. **4**: 293. 1832.
Uredo Pruni Cast. Obs. **1**: 27. 1842.
Uromyces Prunorum Fuckel, Jahrb. Ver. Nat. Nass. **15**: 20. 1861.
Dicaeoma Prunorum Rabh. Fungi Eur. *990*. 1866.
Puccinia discolor Fuckel, Symb. Myc. 50. 1869.
Dicaeoma Pruni-spinosae Kuntze, Rev. Gen. Pl. **3**: 470. 1898.
Aecidium dakotensis Griff. Bull. Torrey Club **29**: 300. 1902.
Aecidium Aikeni Sydow, Ann. Myc. **1**: 334. 1903.

O. Pycnia amphigenous, or sometimes only epiphyllous or hypophyllous, evenly and remotely scattered over large areas, preceding or accompanying the aecia, conspicuous, hemispherical or conoidal, honey-yellow becoming chocolate-brown, subcuticular, 100–160 μ broad, and half as high.

I. Aecia hypophyllous, uniformly scattered over large areas; peridium cylindrical, ample, 0.5 mm. across, dehiscent into few (often 4) widely spreading or recurved lobes; aeciospores globoid or oblong-globoid, 15–23 by 18–26 μ; wall cinnamon-brown, medium thick, 1.5–2.5 μ, closely and minutely verrucose.

ON RANUNCULACEAE:
Anemone caroliniana Walt., Kansas, Louisiana.
Anemone quinquefolia L. (*A. nemorosa* Michx.), Alabama, Illinois, Iowa, Massachusetts, New York, Vermont, Wisconsin; Ontario.
Hepatica acuta (Pursh) Britton (*H. acutiloba* DC.), Illinois, Indiana, Iowa, New York, Pennsylvania, West Virginia, Wisconsin.
Hepatica Hepatica (L.) Karst. (*H. triloba* Chaix.), Delaware, New York, Pennsylvania.
Thalictrum dioicum L., Iowa, Pennsylvania.
Thalictrum purpurascens L., Iowa, Kansas, Nebraska, Ohio, South Dakota.

II. Uredinia hypophyllous, scattered, round, small, 0.5 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis usually noticeable; abundant paraphyses intermixed with the spores, capitate, 12–18 by 45–60 μ, slightly colored and somewhat thickened above, colorless below; urediniospores oblong-clavate or oblong-fusiform, 15–23 by 28–42 μ, narrowed or obtuse above, much narrowed below; wall brownish-yellow above, much paler below, thin, 1–1.5 μ, much thickened and smooth above, 5–9 μ, sparsely and sharply echinulate below, pores 3 or 4, equatorial.

III. Telia hypophyllous, scattered, round, small, 0.3–0.5 mm. across, early naked, somewhat pulverulent, dark chestnut-brown, ruptured epidermis usually noticeable; teliospores oblong or obovate-oblong, 18–27 by 30–39 μ, rounded at both ends, or narrowed below, greatly constricted and easily falling apart at the septum; wall chestnut-brown, often paler below, thin, 1.5–2.5 μ, not thickened above, closely and coarsely verrucose; pedicel colorless, fragile, apparently very short.

ON AMYGDALACEAE:
Amygdalus Persica L., Alabama, California, Florida, Mississippi, South Carolina, Texas; Guatemala; Porto Rico.
Armeniaca vulgaris Lam., Texas.
Padus serotina (Ehrh.) Ag. (*Prunus serotina* Ehrh.), Illinois, Iowa, Maryland, Massachusetts, South Carolina, Texas; Hidalgo, Mexico (state), Veracruz.
Padus virginiana (L.) Roem. (*Prunus virginiana* L.), Illinois, Wisconsin.
Prunus americana Marsh., Illinois, Kansas, Wisconsin.
Prunus americana lanata Sudw., Iowa, Texas.
Prunus Besseyi Bailey, Kansas, Nebraska.
Prunus domestica L., South Carolina, Texas.
Prunus hortulana Bailey, Kansas, Nebraska, Texas.
Prunus umbellata Ell., Florida.
Prunus Watsoni Sarg., Kansas.

TYPE LOCALITY: Europe, on *Anemone ranunculoides*.

DISTRIBUTION: Throughout the United States and eastern Canada, southward into West Indies and Central America, more abundant southward; also in South America, Europe, southern Africa and Australia.

ILLUSTRATION: Beitr. Krypt. Schweiz **2**[2]: *f. 121, 122, 340*.

EXSICCATI: Ellis, N. Am. Fungi *262, 1004, 1047, 1048*; Ellis & Ev. N. Am. Fungi *1828*; Ellis & Ev. Fungi Columb. *49, 49b, 194, 269, 1504, 1580, 1655, 1864*; Sydow, Ured. *300, 1026, 1078, 1179, 1180, 1530*; Rab.-Wint. Fungi Eur. *3023a, 3422*; Roum. Fungi Gall. Exs. *3927*; Rav. Fungi Car. Exs. **5**: *99*; Carleton, Ured. Amer. *30*; Griff. West Am. Fungi *389*.

10. **POLYTHELIS** Arth. Résult. Sci. Congr. Bot. Vienne 341. 1906.

Cycle of development includes pycnia and telia. Pycnia subcuticular, telia subepidermal.

Pycnia depressed conical or hemisperical; hymenium flat.

Telia erumpent, definite, pulverulent, without peridium. Teliospores forming heads or balls by being attached by short, fragile pedicels to a common stalk, which is short and inconspicuous, two-celled by transverse septum, cells rounded and easily falling apart; wall colored, closely verrucose.

Type species, *Puccinia Anemones* Pers. (on *Anemone nemorosa*).

Cells of teliospore not easily separating.	1. *P. retecta*.
Cells of teliospore easily falling apart.	
Both cells of spore globoid.	2. *P. fusca*.
Lower cell of spore elongate.	
Lower cell longer (20–30 μ).	3. *P. Pulsatillae*.
Lower cell shorter (18–26 μ).	4. *P. Thalictri*.

1. **Polythelis retecta** (Sydow) Arth. Résult. Sci. Congr. Bot. Vienne 341. 1906.

Puccinia retecta Sydow, Ann. Myc. **1**: 34. 1903.

O. Pycnia unknown.

III. Telia amphigenous, minute but coalescing into areas up to 4 mm. across, soon naked, pulverulent, cinnamon-brown, ruptured epidermis evident; teliospores ellipsoid-obovate, rounded at both ends, or obtuse below, slightly constricted at septum, 21–27 by 32–40 μ; wall evenly thick, about 2 μ, brown, densely but finely verrucose; pedicel hyaline, as long as the spore, caducous and appearing short.

ON RANUNCULACEAE:
Anemone zephyra A. Nels., Colorado.

TYPE LOCALITY: Buffalo Pass, Park Range, Colorado, on *Anemone narcissiflora*, now considered to be *A. zephyra*.

DISTRIBUTION: Colorado.

ILLUSTRATION: Holway, N. Am. Ured. **1**: *pl. 3, f. 12*.

EXSICCATI: Griff. West Am. Fungi *328*.

2. **Polythelis fusca** (Pers.) Arth. Résult. Sci. Congr. Bot. Vienne 341. 1906.

Aecidium fuscum Pers. in Gmel. Syst. Nat. **2**: 1473. 1791.
Puccinia Anemones Pers. Obs. **2**: 24. 1799.
Dicaeoma fuscum Kuntze, Rev. Gen. Pl. **3**: 466. 1898.

O. Pycnia amphigenous, sometimes wholly on one side of leaf or the other, few, widely scattered, papillose, dark-brown becoming black, subcuticular, depressed-hemispherical, 110–120 μ broad, about 80 μ high.

III. Telia hypophyllous, evenly scattered over the surface, sometimes confluent, round, 0.4–0.8 mm. across, pulvinate, soon naked, pulverulent, chestnut-brown, ruptured epidermis inconspicuous; teliospores ellipsoid or oblong, 15–24 by 28–40 μ, greatly constricted at septum, the two cells nearly equal, globoid, easily falling apart; wall chestnut-brown, evenly thick, 2–3 μ, evenly and coarsely verrucose; pedicel colorless, about one half length of spore, 5–8 μ thick, delicate.

ON RANUNCULACEAE:
Anemone quinquefolia L. (*A. nemorosa* Michx.), Illinois, Indiana, Iowa, Massachusetts, Michigan, New Jersey, New York, Ohio, Vermont, Wisconsin; Ontario.
TYPE LOCALITY: Europe, on *Anemone nemorosa*.
DISTRIBUTION: Massachusetts to Ohio and Illinois, and northward into Canada; also in Europe.
ILLUSTRATIONS: Hedwigia Beibl. **42**: *29*; Holway, N. Am. Ured. **1**: *pl. 2, f. 8*; Beitr. Krypt. Schweiz **2**[2]: *f. 73*.
EXSICCATI: Seym. & Earle, Econ. Fungi *451*; Ellis & Ev. N. Am. Fungi *2722*; Ellis & Ev. Fungi Columb. *183a*; Kellerm. Ohio Fungi *106*.

3. **Polythelis Pulsatillae** (Rostr.) Arth. Résult. Sci. Congr. Bot. Vienne 341. 1906.

Puccinia Pulsatillae Rostr.; Vesterg. Bot. Notiser **1902**: 169. 1902. Not *P. Pulsatillae* Kalchb. 1865.
Puccinia suffusca Holway, Jour. Myc. **8**: 171. 1902.

O. Pycnia epiphyllous, few and widely separated, small, brown, subcuticular.

III. Telia hypophyllous, evenly scattered over the surface, never confluent, round, 0.2–0.5 mm. across, pulvinate, long covered by the whitish epidermis, finally dehiscent by a round pore, pulverulent, dark chestnut-brown, ruptured epidermis evident; teliospores elliptic-obovate, 15–28 by 30–60 μ, the upper cell globose, the lower globoid to obovate or cuneate, 10–26 by 20–30 μ, greatly constricted at septum, the two cells easily separating; wall uniformly thick, 2–3 μ, upper cell chestnut-brown, lower cell usually lighter, coarsely and evenly verrucose; pedicel about one third length of spore, colorless, 5–8 μ thick, delicate. Mesospores often abundant.

ON RANUNCULACEAE:
Pulsatilla hirsutissima (Pursh) Britton (*Anemone pulsatilla Nuttalliana* A. Gray), Colorado, Iowa, Montana, South Dakota.
TYPE LOCALITY: Ratscheberg near Teplitz, Bohemia, on *Pulsatilla pratensis*.
DISTRIBUTION: Iowa to Colorado and Montana; also in Europe and Asia.
ILLUSTRATIONS: Holway, N. Am. Ured. **1**: *pl. 3, f. 13a*; Beitr. Krypt. Schweiz **2**[2]: *f. 74*.
EXSICCATI: Griff. West Am. Fungi *273*; Sydow, Ured. *1370*.

4. **Polythelis Thalictri** (Chev.) Arth. Résult. Sci. Congr. Bot. Vienne 341. 1906.

Puccinia Thalictri Chev. Fl. Paris **1**: 417. 1826.
Caeoma (*Uredo*) *Thalictri* Schw. Trans. Am. Phil. Soc. II. **4**: 291. 1832.
Dicaeoma Thalictri Kuntze, Rev. Gen. Pl. **3**: 470. 1898.

O. Pycnia hypophyllous, few, sparingly scattered among the telia, papillose, chestnut-brown, subcuticular, depressed-hemispherical, 110–130 μ broad.

III. Telia hypophyllous, evenly scattered over large areas, never confluent, round, 0.2–0.6 mm. across, dehiscent by a pore, early naked, pulverulent, dark chestnut-brown, ruptured epidermis evident; teliospores ellipsoid or oblong-ovate, 17–26 by 26–52 μ, greatly constricted at septum, the two cells easily separating, upper cell globoid, or rarely elliptical, the lower globoid, obovate or broadly cuneate, 16–26 by 18–26 μ; wall dark chestnut-brown, uniformly thick, 2 μ, coarsely and evenly verrucose; pedicel delicate, colorless, as long as the spore, wholly or partially deciduous. Mesospores usually plentiful.

ON RANUNCULACEAE:
Thalictrum dioicum L., Indiana, Iowa, Minnesota, New York, Pennsylvania, Wisconsin.
Thalictrum Fendleri Engelm., Colorado, Utah, Wyoming.
Thalictrum polygamum Muhl. (*T. Cornuti* T. & G.), Connecticut, Massachusetts, New York, Pennsylvania, Vermont; Ontario.
Thalictrum purpurascens L., Wisconsin.
Thalictrum sparsiflorum Turcz., Colorado.
Thalictrum venulosum Trel., Wyoming.
Thalictrum sp., California.
TYPE LOCALITY: Paris, France, on *Thalictrum flavum*.

DISTRIBUTION: Throughout the northern United States and Canada; also in Europe.
ILLUSTRATIONS: Holway, N. Am. Ured. 1: *pl. 3, f. 13b*; Beitr. Krypt. Schweiz 2^2: *f. 72.*
EXSICCATI: Ellis & Ev. Fungi Columb. *183b, 481*; Clements, Crypt. Form. Colo. *146*; Ellis, N. Am. Fungi *1042*; Sydow, Ured. *1281.*

11. PHRAGMOPYXIS Dietel, in E. & P. Nat. Pfl. 1^{1**}: 70. 1897.

Cycle of development includes pycnia, aecia, uredinia and telia; autoecious. Pycnia subcuticular, other sori subepidermal.

Pycnia conoidal, with ostiolar filaments.

Aecia erumpent, definite, encircled by paraphyses. Aeciospores catenulate; wall colorless, closely verrucose.

Uredinia erumpent, definite, encircled by paraphyses. Urediniospores borne singly on pedicels; wall pale, verrucose, pores indistinct, scattered.

Telia erumpent, indefinite, encircled by paraphyses. Teliospores free, three-celled by transverse septa, verrucose; wall laminate, inner layer firm, colored, outer layer gelatinous, translucent, overlaid by cuticle; more than one pore in each cell and lateral.

Type species, *Phragmopyxis deglubens* (B. & C.) Dietel (on *Leguminosae* sp. indet.).

1. Phragmopyxis deglubens (B. & C.) Dietel, in E. & P. Nat. Pfl. 1^{1**}: 70. 1897.

Triphragmium deglubens B. & C. Grevillea **3**: 55. 1874.
Phragmidium deglubens De-Toni, in Sacc. Syll. Fung. **7**: 749. 1888.
Uropyxis deglubens Magn. Ber. Deuts. Bot. Ges. **17**: 114. 1899.

O. Pycnia epiphyllous, sparingly produced, in groups with aecia, brownish-yellow, punctiform, inconspicuous, subcuticular, conical, small, 60–80 μ broad, half as high; ostiolar filaments 20–24 μ long.

I. Aecia amphigenous, more largely hypophyllous, small, crowded in small circular groups, ruptured epidermis noticeable, pale-yellow; paraphyses peripheral, few, small, linear, 5–7 by 24–29 μ, straight or variously bent and incurved, wall usually thick, sometimes nearly obliterating the lumen, smooth, colorless; aeciospores globoid or ellipsoid, 13–17 by 15–19 μ; wall colorless, thin, 1 μ, finely and closely verrucose.

II. Uredinia caulicolous, oblong or elongate, small, bullate, soon naked, pulverulent, pale brownish-yellow, ruptured epidermis conspicuous; paraphyses same as in aecia, but more abundant; urediniospores obovate or obovate-globoid, 15–16 by 16–26 μ; wall pale-yellow, thin, 1–1.5 μ, finely and closely verrucose, pores very indistinct, 6–8, scattered.

III. Telia caulicolous, elongate and coalescing to form areas 10 mm. long, early naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; paraphyses as in uredinia; teliospores elliptical, 36–45 by 50–60 μ, rounded at both ends, not constricted at septa; wall laminate, inner layer chestnut-brown, evenly thick, 2.5–4 μ, pores 4 in each cell, lateral, outer layer pale amber-color, gelatinous, 3–7 μ thick in water, strongly and evenly verrucose; pedicel as long as the spore, near the spore solid, pale-yellow, 7–10 μ thick, remainder of pedicel thin-walled, colorless and deciduous.

ON FABACEAE:
Benthamantha Edwardsii (A. Gray) Kuntze (*Cracca Edwardsii* A. Gray, *Brittonamra Edwardsii* Kuntze), Morelos, Sonora.
Benthamantha fruticosa Rose, Oaxaca.
TYPE LOCALITY: "Texas," error for northern Sonora, Mexico, on a leguminous plant [*Benthamantha Edwardsii?*].
DISTRIBUTION: Northern Mexico southward; also in South America.
ILLUSTRATIONS: Dietel, *loc. cit. f. 47A*; Hedwigia **31**: *pl. 9, f. 1–6.*

12. UROPYXIS Schröt. Hedwigia **14**: 165. 1875.

Cycle of development includes pycnia, uredinia and telia; autoecious. Pycnia subcuticular, other sori subepidermal.

Pycnia conoidal; hymenium flat; ostiolar filaments usually present.

Uredinia erumpent, definite, usually encircled by paraphyses. Urediniospores borne singly on pedicels; wall pale, finely verrucose, pores usually indistinct and scattered or distinct and zonal.

Telia erumpent, usually definite, sometimes encircled by paraphyses. Teliospores free, two-celled by transverse septum, sparsely verrucose; wall laminate, inner layer firm, colored, outer layer gelatinous, translucent, overlaid by cuticle, pores two in each cell, usually lateral.

Type species, *Uropyxis Amorphae* (M. A. Curt.) Schröt. (on *Amorpha* sp.).

Pores of urediniospores in zones, number definite.
- Pores in one zone; paraphyses absent. — 1. *U. sanguinea.*
- Pores in two zones; paraphyses present, few. — 2. *U. texana.*

Pores of urediniospores scattered, 6 or more.
- Gelatinous layer of teliospores pale amber-colored, swelling moderately.
  - Pedicels of teliospores not swelling in water.
    - Attached portion of pedicel about half length of spore. — 3. *U. Nissoliae.*
    - Attached portion of pedicel very short.
      - Paraphyses numerous. — 4. *U. Petalostemonis.*
      - Paraphyses none. — 5. *U. Roseana.*
  - Pedicels of teliospores swelling in water.
    - Attached portion of pedicel remaining terete. — 6. *U. Daleae.*
    - Attached portion of pedicel becoming globoid. — 7. *U. Eysenhardtiae.*
- Gelatinous layer of teliospores colorless, swelling greatly. — 8. *U. Amorphae.*

1. **Uropyxis sanguinea** (Peck) Arthur.

Uromyces sanguineus Peck, Bot. Gaz. 4: 128. 1879.
Puccinia mirabilissima Peck, Bot. Gaz. **6**: 226. 1881.
Uropyxis mirabilissima Magn. Ber. Deuts. Bot. Ges. **10**: 193. 1892.
Dicaeoma mirabilissimum Kuntze, Rev. Gen. **3**: 469. 1898.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered or somewhat gregarious, on small discolored usually reddish spots, roundish or ovoid, 0.3–0.8 mm. long, soon partially or wholly naked by epidermis rupturing along one side or irregularly, cinnamon-brown, ruptured epidermis especially conspicuous; paraphyses none; urediniospores obovate, pyriform, or ellipsoid, 18–23 by 21–32 μ, often narrowed at base and less often at apex; wall golden-yellow, medium thick, 2.5–3 μ, finely and closely verrucose, pores 4, equatorial.

III. Telia hypophyllous, at first arising from the uredinia, usually not plentiful, scattered, round, 0.3–0.5 mm. across, soon naked, pulvinate, ruptured epidermis usually inconspicuous; teliospores ellipsoid, 20–25 by 30–35 μ, rounded at both ends, much constricted at septum; wall laminate, chestnut-brown, uniformly thick, 3–5 μ, gelatinous layer inconspicuous, finely and closely verrucose, pores two in each cell and lateral; pedicel colorless, persistent, uniform diameter, about 6 μ, solid except at base, 100–150 μ long.

ON BERBERIDACEAE:
Mahonia Aquifolium (Pursh) Nutt. (*Berberis Aquifolium* Pursh, *B. repens* Lindl., *B. nana* Greene, *Odostemon Aquifolium* Rydb.), Arizona, California, Colorado, Idaho, Montana, Nebraska, New Mexico, South Dakota, Utah, Wyoming.
Mahonia diversifolia Sweet (*Berberis Aquifolium* Lindl., *Odostemon nutkanus* Rydb.), Oregon, Washington.
Mahonia nervosa (Pursh) Nutt. (*Berberis nervosa* Pursh), California.
Mahonia pinnata (Lag.) Fedde (*Berberis pinnata* Lag.), California; Guatemala.
Mahonia pumila (Greene) Fedde (*Berberis pumila* Greene), Oregon.

TYPE LOCALITY: Colorado, on *Berberis Aquifolium*.

DISTRIBUTION: Throughout the mountain region from Wyoming and Washington south to Guatemala.

ILLUSTRATIONS: Holway, N. Am. Ured. **1**: *pl. 4, f. 18a–b*; Ber. Deuts. Bot. Ges. **10**: *pl. 19, f. 1–7*.

EXSICCATI: Ellis & Ev. Fungi Columb. *186*; Ellis, N. Am. Fungi *1451*; Ellis & Ev. N. Am. Fungi *1860, 2243*; Sydow, Ured. *879, 1777*; Griff. West Am. Fungi *265*; Garrett, Fungi Utah *10*; Rab.-Wint. Fungi Eur. *3619*.

2. **Uropyxis texana** (Holway & Long) Arthur.

Puccinia texana Holway & Long, Bull. Torrey Club **29**: 113. 1902.

O. Pycnia unknown.

II. Uredinia hypophyllous, in small orbicular groups on discolored spots, roundish, 0.2–0.5 mm. across, soon partially or wholly naked by epidermis rupturing along one side or irregularly, cinnamon-brown, ruptured epidermis especially conspicuous; paraphyses few, peripheral, inconspicuous, erect, terete, 10–14 by 25–40 μ, wall colorless, smooth, thin 1 μ; urediniospores obovate or globoid, 17–22 by 21–32 μ; wall golden-yellow, medium thick, 2–3 μ, finely and closely verrucose, pores 8, in two zones of 4 each, equidistant from equator.

III. Telia hypophyllous, scattered, similar to uredinia but chestnut-brown and somewhat pulverulent; teliospores ellipsoid, 21–25 by 27–34 μ, rounded at both ends, partly umbonate above, slightly constricted at septum; wall obscurely laminate, chestnut-brown, medium thick, 2.5–3.5 μ, thicker and paler at umbo, 3–5 μ, minutely verrucose, appearing smooth, pores two in each cell and lateral, or one of those in upper cell in the umbo; pedicel colorless, thin-walled, fragile, partially deciduous, appearing short.

ON BERBERIDACEAE:
Mahonia trifoliolata (Moric.) Fedde (*Berberis trifoliolata* Moric., *B. trifoliata* Hartw.), Texas.
TYPE LOCALITY: Austin, Texas, on *Berberis trifoliolata*.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 4, f. 19*.

3. **Uropyxis Nissoliae** (Dietel & Holway) Magn. Ber. Deuts. Bot. Ges. **17**: 115. 1899.

Puccinia Nissoliae Dietel & Holway, Bot. Gaz. **24**: 27. 1897.

O. Pycnia epiphyllous, few in small groups, punctiform, golden-yellow becoming brown, subcuticular, conoidal, 90–110 μ broad and half as high.

II. Uredinia hypophyllous, scattered or in crowded groups, round, small, 0.1–0.2 mm. across, soon naked, pale cinnamon-brown, ruptured epidermis, rather inconspicuous; paraphyses peripheral, few, erect, clavate, 15–22 by 30–45 μ, wall colorless, thin, about 1 μ, smooth; urediniospores broadly ellipsoid or globoid, 12–15 by 14–20 μ; wall pale-yellow, thin, 1 μ, echinulate-verrucose, pores small, 6 or more, very obscure.

III. Telia hypophyllous, at first arising from the uredinia, scattered, round, small, 0.2–0.5 mm. across, soon naked, chocolate-brown, pulverulent, ruptured epidermis mostly inconspicuous; paraphyses none; teliospores elliptical, 25–27 by 32–40 μ, rounded at both ends, scarcely constricted at septum; wall laminate, inner layer chestnut-brown, 2.5–3.5 μ thick, pores 2 in each cell, lateral and opposite, outer layer pale amber-colored, gelatinous, 1.5–2 μ thick in water, closely verrucose; pedicel colorless, half as long as the spore, terete, solid, not swelling in water, 5–6 μ thick, fragile.

ON FABACEAE:
Nissolia confertiflora S. Wats., Jalisco.
Nissolia hirsuta DC. Jalisco, Morelos.
Nissolia laxior Rose, Jalisco.
Nissolia multiflora Rose, Oaxaca.
TYPE LOCALITY: Guadalajara, Mexico, on *Nissolia confertiflora*.
DISTRIBUTION: Southern Mexico.
EXSICCATI: Sydow. Ured. *1524*.

4. **Uropyxis Petalostemonis** (Farl.) De-Toni, in Sacc. Syll. Fung. **7**: 735. 1888.

Puccinia Petalostemonis Farl.; Trelease, Trans. Wis. Acad. **6**: 129. 1884.

O. Pycnia hypophyllous, scattered among the uredinia, brownish-yellow, punctiform, inconspicuous, subcuticular, conoidal, small, 80–120 μ broad, and half as high.

II. Uredinia hypophyllous, scattered, round or oblong, 0.2–0.5 mm. long, soon naked, pale cinnamon-brown, pulverulent, ruptured epidermis conspicuous; paraphyses peripheral, numerous, incurved and variously bent, linear or linear-clavate, 7–16 by 40–65 μ, wall pale-yellow, thick, 3–5 μ, often obliterating the lumen, smooth; urediniospores oblong or obovate, 18–21 by 21–26 μ; wall medium thin, 1.5–2 μ, pale-yellow, closely verrucose, pores 6–8, scattered, moderately distinct.

III. Telia hypophyllous, scattered, round or oblong, 0.2–0.5 mm. long, soon naked, dark chocolate-brown, pulverulent, ruptured epidermis somewhat noticeable; paraphyses as in uredinia; teliospores elliptical, 21–29 by 39–45 μ, rounded at both ends, slightly constricted at septum; wall laminate, inner layer chestnut-brown, 2–3 μ thick, pores 2 in each cell, lateral and opposite, outer layer pale amber-color, gelatinous, 1.5–2 μ thick in water, closely verrucose; pedicel colorless, short, not swelling in water, terete.

ON FABACEAE:
Petalostemon candidus (Willd.) Michx., Kansas, Nebraska.
Petalostemon multiflorus Nutt., Kansas.
Petalostemon purpureus (Vent.) Rydb. (*P. violaceus* Michx.), Kansas, Nebraska, North Dakota, Wisconsin.
TYPE LOCALITY: La Crosse, Wisconsin, on *Petalostemon* sp.
DISTRIBUTION: Northern Mississippi Valley.
EXSICCATI: Carleton, Ured. Am. *8;* Ellis & Ev. N. Am. Fungi *1844;* Ellis & Ev. Fungi Columb. *1692.*

5. **Uropyxis Roseana** Arthur, sp. nov.

O. Pycnia amphigenous, few in small groups surrounded by uredinia, brownish-yellow, punctiform, inconspicuous, subcuticular, frustum-like, small, 80–110 μ broad by 60–80 μ high.

II. Uredinia amphigenous, in small annular groups, often confluent on slightly discolored spots, round or oblong, 0.3–0.8 mm. long, soon naked, pale cinnamon-brown, pulverulent, ruptured epidermis conspicuous; paraphyses none; urediniospores obovate or ellipsoid, 17–22 by 23–27 μ; wall thin, 1–1.5 μ, pale-yellow, echinulate-verrucose, pores numerous, 12 or more, scattered, obscure.

III. Telia not seen; teliospores in the uredinia elliptical, 18–23 by 29–37 μ, rounded at both ends, slightly constricted at septum; wall laminate, inner layer cinnamon-brown, 1.5–2.5 μ thick, pores 2 in each cell, lateral and opposite, outer layer colored, barely perceptible, verrucose with fine points 2–3 μ apart; pedicel colored, very short, not swelling in water, slender.

ON FABACEAE:
Cracca Talpa (S. Wats.) Rose, Querétaro.
Type collected at Hacienda Ciervo, State of Querétaro, Mexico, August 20, 1905, *J. N. Rose 9694.*

6. **Uropyxis Daleae** (Dietel & Holway) Magn. Ber. Deuts. Bot. Ges. **17**: 115. 1899.

Puccinia Daleae Dietel & Holway, Bot. Gaz. **24**: 27. 1897.

O. Pycnia unknown.

II. Uredinia chiefly hypophyllous, scattered, or gregarious on yellow spots, often circinating, round, 0.2–0.7 mm. across, soon naked, pale cinnamon-brown, somewhat pulverulent, ruptured epidermis usually noticeable; paraphyses peripheral, abundant, variously bent and incurved, linear-clavate or somewhat capitate, 13–23 by 50–77 μ, wall nearly or quite colorless, irregularly thickened, thicker above, 5–7 μ, smooth; urediniospores broadly ellipsoid or globoid, 16–22 by 18–25 μ; wall medium thin, 1–1.5 μ, thicker when immature, pale golden yellow, finely and closely echinulate-verrucose, pores numerous, 12 or more, scattered, obscure.

III. Telia chiefly hypophyllous, scattered, round, 0.3–0.8 mm. across, soon naked, chocolate-brown, somewhat pulverulent, ruptured epidermis usually noticeable; paraphyses as in uredinia, but less numerous; teliospores elliptical, 24–28 by 35–47 μ, rounded at both ends, slightly constricted at septum; wall laminate, inner layer chestnut-brown, 3–4 μ thick, pores 2 in each cell, lateral and opposite, outer layer pale amber-color, gelatinous, 1.5–2.5 μ thick in water, finely and evenly verrucose; pedicel colorless, half as long as spore, in water swelling to 18 μ or more thick.

ON FABACEAE:
Parosela acutifolia (DC.) Rose (*Dalea acutifolia* DC.), Morelos.
Parosela citriodora (Willd.) Rose (*Dalea citriodora* Willd.), Jalisco.
Parosela Dalea (L.) Britton (*Dalea alopecuroides* Willd.), Jalisco.
Parosela Holwayi Rose, Guerrero.
Parosela mucronata (DC.) Rose (*Dalea mucronata* DC.), Jalisco.
Parosela mutabilis (Cav.) Rose (*Dalea mutabilis* Willd.), Hidalgo, Mexico (state).
Parosela trifoliata (Zucc.) Rose (*Dalea trifoliata* Zucc.), Aguascalientes, Mexico (state).
TYPE LOCALITY: Near Tula, Mexico, on *Dalea* [*mutabilis*].
DISTRIBUTION: Central and southern Mexico.
EXSICCATI: Sydow, Ured. *1519.*

7. **Uropyxis Eysenhardtiae** (Dietel & Holway) Magn. Ber. Deuts. Bot. Ges. **17**: 115. 1899.

Puccinia Eysenhardtiae Dietel & Holway, Bot. Gaz. **24**: 27. 1897.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered, round, small, 0.1–0.2 mm. across, soon naked, pale-yellow, somewhat pulverulent, ruptured epidermis not noticeable; paraphyses peripheral, very abundant and prominent, strongly incurved, scimitar-shaped, 10–18 by 42–77 μ, wall nearly or quite colorless, thin on concave side, much thickened on convex side and apex, 3-5 μ, smooth; urediniospores nearly globoid, small, 14–17 by 15–21 μ; wall thin, 1 μ, pale-yellow, echinulate-verrucose, pores about 6–8, scattered, very obscure.

III. Telia hypophyllous, at first arising from the uredinia, scattered, round, small, 0.1–0.2 mm. across, soon naked, chocolate-brown, pulverulent, ruptured epidermis inconspicuous; paraphyses as in uredinia and equally abundant; teliospores elliptical, 24–28 by 36–45 μ, rounded at both ends, slightly or not constricted at septum; wall laminate, inner layer chestnut-brown, 2.5–3 μ thick, pores 2 in each cell, lateral and opposite, outer layer pale amber-colored, gelatinous, 2–3 μ thick in water, sparsely and evenly verrucose; pedicel colorless, half length of spore or longer, in water swelling to 18 μ and becoming nearly globular.

ON FABACEAE:
Eysenhardtia amorphoides H.B.K., Jalisco.
Eysenhardtia orthocarpa (A. Gray) S. Wats., Mexico (state).
TYPE LOCALITY: Near City of Mexico, Mexico, on *Eysenhardtia orthocarpa*.
DISTRIBUTION: Southern Mexico.

8. **Uropyxis Amorphae** (M. A. Curt.) Schröt. Hedwigia **14**: 165. 1875.

Puccinia Amorphae M. A. Curt. Am. Jour. Sci. II. **6**: 353. 1848.
Uredo kansensis Kellerm. & Swingle, Jour. Myc. **5**: 77. 1889.

O. Pycnia amphigenous, largely epiphyllous, numerous, crowded in small groups, punctiform, golden-yellow becoming brown, subcuticular, conoidal, 70–90 μ broad, half as high or more; ostiolar filaments 30–60 μ long.

II. Uredinia at first hypophyllous and crowded in orbicular groups on discolored spots, soon chiefly epiphyllous and scattered, round, 0.2–0.8 mm. across, soon naked, pale yellow, somewhat pulverulent, ruptured epidermis inconspicuous; paraphyses peripheral, abundant and prominent, strongly incurved, clavate, 10–15 by 42–60 μ, wall very pale-yellow, thin on concave side, 1 μ, much thickened on convex side, 5–7 μ, smooth; urediniospores ellipsoid or obovate, 12–20 by 18–30 μ; wall medium thick, 2–2.5 μ, pale-yellow, finely and closely verrucose, pores 10 or more, scattered, obscure.

III. Telia chiefly epiphyllous, at first arising from the uredinia, scattered or somewhat grouped, roundish, 0.3–0.7 mm. across, soon naked, dark chocolate-brown, pulverulent, ruptured epidermis inconspicuous; paraphyses as in uredinia and equally abundant; teliospores elliptical, 28–36 by 35–48 μ in water, rounded at both ends, somewhat constricted at septum; wall laminate, inner layer chocolate-brown, 2.5–3 μ thick, pores 2 in each cell, lateral and opposite, outer layer colorless, gelatinous, becoming in water 7–15 μ thick at sides and 1–3 μ thick at apex and base, finally bursting and disappearing, sparsely and evenly verrucose; pedicel colorless, as long as the spore, fragile and partly deciduous, swelling in water and bursting.

ON FABACEAE:
Amorpha angustifolia (Pursh) Boynton, Colorado, Kansas, New Mexico, Wyoming.
Amorpha californica Nutt., California.
Amorpha canescens Pursh, Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin.
Amorpha fruticosa L., Alabama, Georgia, Illinois, Iowa, Kansas, Louisiana, Minnesota, Mississippi, Nebraska, North Dakota, South Carolina, South Dakota, Texas, Wisconsin.
Amorpha herbacea Walt., Florida, South Carolina.
Amorpha laevigata Nutt., New Mexico.
Amorpha nana Nutt. (*A. microphylla* Pursh), Iowa, South Dakota.
Amorpha virgata Small, Florida.
TYPE LOCALITY: Society Hill, South Carolina, on *Amorpha herbacea*.

DISTRIBUTION: From the Atlantic to the Pacific coasts of the United States, especially abundant in the Mississippi valley.

EXSICCATI: Seym. & Earle, Econ. Fungi *202*; Ellis, N. Am. Fungi *1036*; Ellis & Ev. N. Am. Fungi *2255*, *2418*, *3148*; Ellis & Ev. Fungi Columb. *562*, *655*, *1690*; Carleton, Ured. Am. *13*; Griff. West Am. Fungi *32*, *247*; Sydow, Ured. *786*, *1034*, *1035*, *1088*; Thümen, Myc. Univ. *1037*; Roum. Fungi Gall. *4404*; Rav. Fungi Car. 1: *97*; Rav. Fungi Am. Exs. *39*, *40*, *279*; Rab.-Wint.-Paz. Fungi Eur. *3831*.

13. **CALLIOSPORA** Arth. Bot. Gaz. **39**: 390. 1905.

Cycle of development includes only pycnia and telia, the former subcuticular, the latter subepidermal.

Pycnia conoidal; hymenium flat; ostiolar filaments usually present.

Telia erumpent, somewhat indefinite, without paraphyses. Teliospores free, two-celled by transverse septum, verrucose or smooth; wall laminate, inner layer firm, colored, outer layer gelatinous, translucent, overlaid by cuticle, pores two in each cell and lateral.

Type species, *Calliospora Holwayi* Arth. (on *Eysenhardtia amorphoides*).

Gelatinous layer amber-colored, pedicel swelling to bursting. 1. *C. Diphysae.*
Gelatinous layer colorless.
  Pedicel swelling to bursting. 2. *C. Holwayi.*
  Pedicel swelling slightly, mostly deciduous. 3. *C. Farlowii.*

1. **Calliospora Diphysae** Arth. Bot. Gaz. **39**: 391. 1905.

O. Pycnia amphigenous, crowded in branching groups, or disposed in lines, bullate or hemispherical, smooth, pale-brown, subcuticular, 100–175 μ wide, less than half as high; ostiolar filaments wanting.

III. Telia amphigenous and caulicolous, round or elongate, 1–5 mm. long, early naked, blackish, pulverulent, ruptured epidermis conspicuous; teliospores elliptical, 30–33 by 45–50 μ, rounded at both ends, not constricted at septum; wall laminate, inner layer dark chestnut-brown, 3–4 μ thick, pores 2 in each cell, lateral and opposite, outer layer pale amber-colored, gelatinous, 3–4 μ thick in water, sparsely and evenly verrucose; pedicel half length of spore or longer, colorless, smooth, firm above, at base slightly bulbous and swelling in water to bursting.

ON FABACEAE:
Diphysa suberosa S. Wats., Jalisco.
TYPE LOCALITY: Rio Blanco, Guadalajara, Mexico, on *Diphysa suberosa*.
DISTRIBUTION: Known only from the type locality.

2. **Calliospora Holwayi** Arth. Bot. Gaz. **39**: 390. 1905.

O. Pycnia epiphyllous, numerous over areas 2–7 mm. across, punctiform, golden-yellow becoming brown, subcuticular, conical, 80–125 μ wide; ostiolar filaments 45–65 μ long.

III. Telia epiphyllous, scattered, sometimes confluent, small, round, 0.3–0.7 mm. across, chocolate-brown, somewhat pulverulent, ruptured epidermis noticeable; teliospores elliptical, 26–34 by 40–51 μ, rounded at both ends, slightly or not constricted at septum; wall laminate, inner layer chocolate-brown, thick, 3–4 μ, pores 2 in each cell, lateral and opposite, outer layer colorless, gelatinous, 2–3 μ thick in water, smooth; pedicel colorless, as long as the spore, swelling in water to the diameter of the spore and bursting.

ON FABACEAE:
Eysenhardtia amorphoides H.B.K., Jalisco, Oaxaca.
Eysenhardtia orthocarpa (A. Gray) S. Wats., Oaxaca.
TYPE LOCALITY: Etla, State of Oaxaca, Mexico, on *Eysenhardtia orthocarpa*.
DISTRIBUTION: Southern Mexico.

3. **Calliospora Farlowii** Arth. Bot. Gaz. **39**: 391. 1905.

O. Pycnia caulicolous and sparingly on the midrib on both sides of the leaf, small, punctiform, yellowish-brown, subcuticular, conoidal, 80–100 μ wide; ostiolar filaments 25–40 μ long.

III. Telia caulicolous, linear, 2–3 mm. long, causing hypertrophy, crowded, often confluent, early naked, cinnamon-brown, very pulverulent, ruptured epidermis noticeable; teliospores elliptical, 18–24 by 29–42 μ, rounded at both ends, slightly or not constricted

at septum; wall laminate, inner layer cinnamon-brown, medium thick, 2–3 μ, pores 2, lateral and opposite, outer layer gelatinous, colorless, barely noticeable when swollen in water, 1–1.5 μ, minutely verrucose; pedicel colorless, about 6 μ thick, short and largely deciduous.

ON FABACEAE:
Parosela domingensis (DC.) Heller (*Dalea domingensis* DC.), Oaxaca, San Luis Potosi; Cuba.
TYPE LOCALITY: Orizaba, Mexico, on *Dalea domingensis*.
DISTRIBUTION: Mexico and West Indies.

14. **PROSPODIUM** Arth. Jour. Myc. **13**: 31. 1907.

Cycle of development includes pycnia, uredinia and telia; autoecious. All sori subcuticular.

Pycnia hemispherical; hymenium flat; ostiolar filaments wanting.

Uredinia erumpent, definite, usually encircled by paraphyses. Urediniospores borne singly on pedicels, globoid or obovoid; wall colored, verrucose, often with a gelatinous layer, pores usually two.

Telia erumpent, definite, usually encircled by paraphyses. Teliospores free, two-celled by transverse septum, sparsely verrucose; wall somewhat laminate, inner layer firm, colored, outer layer gelatinous, thin, translucent, pores one in each cell, apical in upper cell, near the pedicel in lower cell; pedicels refractive, usually appendaged.

Type species, *Puccinia Amphilophii* Dietel & Holway (on *Pithecoctenium hexagonum*).

Urediniospore-wall inflated; pedicels of teliospores strongly appendaged. 1. *P. appendiculatum*.
Urediniospore-wall not noticeably inflated; pedicels slightly appendaged. 2. *P. Amphilophii*.

1. **Prospodium appendiculatum** (Wint.) Arth. Jour. Myc. **13**: 31. 1907.

Puccinia appendiculata Wint. Flora **67**: 262. 1884.
Puccinia ornata Hark. Proc. Calif. Acad. II. **2**: 231. 1889.
Puccinia medusaeoides Arth. Bot. Gaz. **16**: 226. 1891.
Dicaeoma Stantis Kuntze, Rev. Gen. **3**: 467. 1898.
Dicaeoma appendiculata Kuntze, Rev. Gen. **3**: 467. 1898.
Puccinia Tecomae Sacc. & Sydow; Sacc. Syll. Fung. **14**: 358. 1899.

O. Pycnia unknown.

II. Uredinia chiefly hypophyllous, scattered, minute, punctiform, soon naked, light cinnamon-brown, ruptured cuticle inconspicuous; paraphyses peripheral, short, incurved, spoon-shaped, 6–10 by 30–40 μ, wall thin, colorless, smooth; urediniospores broadly obovate or globoid, 19–25 by 23–28 μ, wall laminate, inner layer cinnamon-brown, rather thin, 1–2 μ, outer layer paler, gelatinous, swelling irregularly up to 5 μ, especially at apex, sparsely and evenly verrucose, pores indistinct, 2, opposite and equatorial.

III. Telia chiefly hypophyllous, resembling the uredinia, but blackish and with fewer but similar paraphyses; teliospores elliptical, 23–30 by 40–50 μ, rounded at both ends, slightly constricted at septum; wall chestnut-brown, thick, 4–6 μ, gelatinous layer golden-yellow, not conspicuous except at apex and base, where it produces an umbo-like thickening, sparsely and finely verrucose; pedicel colorless, firm, once to twice length of spore, with about three whorls of large branched appendages.

ON BIGNONIACEAE:
Stenolobium molle (H.B.K.) Seem. (*Tecoma mollis* H.B.K.), Morelos, Oaxaca, Puebla.
Stenolobium Stans (L.) D. Don (*Tecoma Stans* Juss.), Cuba.
TYPE LOCALITY: Mexico, on *Bignoniaceae* sp. indet.
DISTRIBUTION: Central Mexico and West Indies southward; also in South America.
ILLUSTRATION: Hark. *loc. cit. pl. 12.*

2. **Prospodium Amphilophii** (Dietel & Holway) Arth. Jour Myc. **13**: 31. 1907.

Puccinia Amphilophii Dietel & Holway, Bot. Gaz. **24**: 30. 1897.
Puccinia phlyctopus Sydow, Monog. Ured. **1**: 242. 1902.

O. Pycnia epiphyllous, gregarious, brownish, inconspicuous, hemispherical or conoidal, 80–110 μ broad, half as high; hymenium flat.

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